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ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

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The Printers' Strike Ended

SINCE the beginning of the printers' strike in New York, our readers, by the hundreds, have evinced their interest by writing letters commending our stand and inquiring as to the situation and the likelihood of early settlement of the difficulty.

We are glad now to say that our troubles promise soon to be over. The pressmen began returning three weeks ago, and at the present writing the composing-room force is being rapidly recruited. The men are returning on the terms offered by the publishers preceding the strike. In other words, the justice of our offer has prevailed. The radicals have lost.

We say that without bitterness or a feeling of revengeful triumph. All parties have suffered—the printers, the publishers, and the public. A handful of radicals must carry all the blame. The great majority of the men wanted to be fair. Fear of personal violence kept them away, not because they were afraid of being hurt, but because of the consequences of their disablement on their families.

The resumption of work is brought about by the pressmen and feeders individually leaving the outlawed local unions and taking cards in the new internationals. The radical leaders still stand out, but they are leaders without followers. The compositors, never officially on strike, are returning because of union action.

While the strike was under way the publishers were far from being idle. Every effort was made to print the magazines outside New York. In this effort the McGraw-Hill Company was successful with seven of its ten New York printed journals. But no outside printers were willing to take the two largest magazines, *Engineering News-Record* and *American Machinist*, nor the Spanish paper, *Ingenieria Internacional*. Consequently these had to stay at home. *American Machinist* was lithographed in a New York plant, and the forms of *Ingenieria Internacional* held, thus giving over our own plant to *Engineering News-Record* whenever printing could be resumed.

If space were available we could tell an interesting story of emergency organization. Instead of the simple method of sending manuscript two floors below and putting it through a marvelously coördinated machine, manned by a force trained for years in handling the special problem of weekly-magazine publishing, it was necessary to establish a new organization attuned to direct work in seven different cities, the farthest away being San Francisco. To each plant went one of the editors and one of the business representatives of the appropriate paper and these men were supplemented as needed by mechanical and publishing experts. The emergency plants in no case were synchronized to do our work; some were job plants, others had printed monthly magazines, while one had done nothing but book work. All worked with a will, but they lacked that special experience upon which efficient functioning depends. Meanwhile, a clearance committee had been established at New York. Sitting for hours each day it received reports by telegraph and telephone from each plant, straightening out difficulties, insuring adequate supplies of paper (handicapped by a short market and wretched transportation service), forwarding cuts and other supplies, sometimes by auto-truck when express service was too slow, and frequently dispatching specialists when the difficulties seemed to get beyond the local resources.

No less effort was expended by other men in bringing about the resumption of work in New York. About three weeks ago pressmen and feeders began to return, and the belated Oct. 2 issue of *Engineering News-Record* was put on the presses. Much matter had been put into type before the strike came, and this was made up into pages. No new matter could be set, however, and so in this and the last two issues the timely matter—the news and the editorials—has been photo-engraved from typewritten pages. With the return of compositors this week there is promise that we shall be able after this issue to drop the emergency method, and send out again the familiar well-printed, crisp-looking *News-Record*.

While, therefore, the readers have been inconvenienced, we have not been idle. We set out to maintain a principle, and we determined that no work would be too hard and no sacrifice too great to maintain it. In our determination, in the fighting of obstacles we were very much encouraged by the splendid support of our readers. They realized that compromise with radicalism would be disloyalty to American industry and to the American public. We are glad to say that the New York printers' strike can now be bracketed with the other failures of radicalism—the Boston policemen's strike, the steel and the coal strikes.

Counted in dollars and cents the publishers have been heavy losers. But from the viewpoint of principle a great moral victory has been won for the sane, solid forces of the nation.

The Railroad Problem

WE commend to the careful consideration of our readers Charles Whiting Baker's lucid discussion in this issue of the railroad problem. It will be found to contain a clear recognition and careful weighing of all the factors. The first installment lays the groundwork for the solution, which will be presented in the second and concluding section next week. At that time there will be editorial discussion on the plan. In his fourth chapter, appearing in part in this week's install-

ment, Mr. Baker's strictures appear severe, but we must none the less concede their truth. In fact, the railroad problem is with us in such acuteness today because of the conditions he describes. If there be some who protest at his severity and believe that closer Government regulation will eliminate all the manipulation of the past, it may be answered that the public appears not to be so hopeful. The confidence which the railroad managements lost in the days of railroad debauchery has not been regained.

Engineers Should Back These Recommendations

CHOOSING a state engineer by popular vote is contrary to both common sense and sound political theory. Yet the practice still prevails in the great State of New York, which thus puts upon a million voters the choice of a man to fill an office demanding high and varied technical qualifications. Such a choice can be made wisely and the official chosen held responsible to his duties by one man only, and that man should be the chief executive of the state. The matter is brought to public attention in connection with other admirable recommendations of the Retrenchment Committee of the State Reconstruction Commission of New York. These recommendations include shortening of the ballot so as to reduce from seven to three the number of general administrative officers elected by popular vote—the Governor, Lieutenant Governor and Controller—a most desirable change. Further commendable recommendations are the reduction of state administrative departments from 187 to 19, most of which would be single-headed; and provision for a consolidated state budget, formulated by the Governor. The fact that essentially the same proposals were submitted as constitutional amendments in 1915 and defeated by a half-million majority shows the need of a persistent educational campaign to secure their adoption. In this the engineers of the state should not fail to play an important part, first by thoroughly informing themselves concerning the proposals and the fundamental reasons for their adoption, and, next, by bringing these reasons close home to their representatives in the state legislature. The engineering societies of the state have here an opportunity and a duty that they should fulfil.

America in European Eyes

LATE last month Charles H. Grasty, the well known foreign correspondent of the New York *Times*, returned to Europe after having spent some time in getting re-acquainted with conditions in the United States. After his return to the other side he wrote the following illuminating comment to his paper:

"To one going home after several years at war, America somehow does not seem normal and natural. The observer is struck by the high state of activity prevailing, but it does not seem entirely wholesome. There is too much prosperity, and the extent of the extravagance is sinful to eyes accustomed to the more economical ways of Europe.

"The unrest seems peevish and self-indulgent and without any quality of 'noble discontent.' There are no deep wrongs to be righted, and to a newcomer on the scene the agitation has little justification in the economic conditions which exist."

And against this impression made on him by his own land is this fresh impression of the England of late October:

"Arriving in Europe, one sees in England an improvement as compared with four months ago that is unmistakable. The whole atmosphere is different. The difficulties that were there then are still there, but the temper is changed. The failure of the recent [railroad] strike, not so much because of the outcome, but because of the way the people acted, has had a profound effect on the public morals. Good British horse sense has redemonstrated itself.

"England is not going to be run away with by any element. She is doing business at the old stand. Sacrifices and readjustments will go on for many a year, but there will be no breakdowns or upsets."

Are we not right in believing that the same sort of horse sense that Mr. Grasty finds in England is beginning to assert itself here and will eliminate the extravagance and peevish discontent which Mr. Grasty found?

Mechanical Society's Alliance with Employers

ENGINEERS are a unit in favoring a more general participation by members of the profession in civic affairs having an engineering bearing. As a result our societies are with more and more frequency expressing themselves on non-technical questions and forming alliances through which a larger public influence can be wielded. Care must be exercised, however, lest alliances be formed which are not consonant with the fundamentals on which the societies rest. If the fundamentals be compromised, the damage to professional standing will outweigh any possible good that may flow from the activity; in fact the only result may be damage, without any benefit whatsoever. Moreover, the professional prestige of our great engineering societies is so important, that untoward action of any one of them has an interest far outside its immediate membership. A case in point is a recent action of the American Society of Mechanical Engineers.

The society has taken membership in the National Industrial Conference Board, an organization consisting of associations of manufacturers banded together to study the labor problem. Mr. Morris L. Cooke, of Philadelphia, has entered protest against the action and has urged withdrawal, contending that the society's professional purpose demands that it remain impartial.

With Mr. Cooke's contention we are in accord. The society by taking membership in the board has made an alliance with one party to the industrial controversy, a position inconsistent with the professional attitude. And the reason is not merely the one Mr. Cooke has given, though that is fundamental. Additional objection is found in the fact that the board definitely allied itself with the employers as against the employees when it accepted the President's invitation to appoint part of the employers' group in the recent Industrial Conference in Washington.

It may be contended that the majority of members of the society, because of their education and traditions, as well as their service in industrial corporations, sympathize with the employers' as against the employees' viewpoint, and that, therefore, the society in taking sides with the employers would act in accordance with

the views of the members. That view is not sound. The society opens its full membership only to those who have technical qualifications, while its avowed object is to promote the development of the science and practice of engineering. When the member functions in the society he does so as a professional man, and in so far as he brings in a bias he is untrue to the proper spirit of the organization.

It should be said that the society does not attempt to justify alliance with the employers. In fact, we are informed that membership was taken without any thought that the society would be placed in a stultifying position. The organization was merely seeking to discharge properly its civic responsibility, and joined the conference board on the recommendation of a special committee formed to consider the sort of industrial relations activities in which the society might properly engage. It is significant, though, that the committee was composed of three executives of large industrial corporations, the managing director of the National Industrial Conference Board itself, and a former railroad official, then serving as chairman of the War Service Committees of the national Chamber of Commerce. Now that the propriety of the action has been questioned the society's council has appointed a committee to consider and report on the matter.

The case here discussed is clear cut, but it brings up questions with some similarity which are not quite so simple. Engineering Council, the American Association of Engineers and the American Institute of Consulting Engineers have taken membership in the Chamber of Commerce of the U. S. A., while many local engineering societies have joined their local chambers of commerce. Are these improper or stultifying relations?

The Chamber of Commerce of the U. S. A., like the National Industrial Conference Board, nominated part of the membership of the employers' group at the Washington conference, and so accepted identification with the employing as against the labor interests. On the other hand, the chamber does not address itself solely to labor problems. In fact, little of its time has been devoted to labor; its function is to consider all manner of economic questions.

Still another factor enters. Engineering Council and the American Association of Engineers have as their sole object the civic relations and welfare activities of the profession, while the consulting engineers' institute regards civic work as one of its chief functions. The council is in no sense a technical body; the institute has a dual function.

These two conditions place membership in the national chamber in a category different from the A. S. M. E. membership in the National Industrial Conference Board: (1) The broad economic function of the chamber, and (2) the civic character of the council, the association and the institute as distinguished from the essentially technical and professional character of the A. S. M. E.

One other difference there is—and while it may be of impression rather than provable fact, it is none the less pertinent—the National Industrial Conference Board is regarded as an anti-labor body, the chamber is not.

Under these circumstances membership of the council and the institute in the chamber are not necessarily stultifying. If under unwise leadership the chamber should assume a bourbon attitude on labor or an unfair position to the public on any question, withdrawal or public protest might be demanded.

The same general arguments apply to the affiliation of local societies with local chambers of commerce. The latter have broad civic functions, generally comprehending consideration of the many engineering features of a municipal administration, while the societies themselves have civic and welfare as well as professional purposes. The conclusion is the same—that such affiliations are not necessarily stultifying.

We all desire to see the engineer broaden his influence in the community and to discharge his civic responsibility. His societies can perform those functions, though, only by acting as a wise counselor, not as a member of a partisan body.

Professional Prestige

AS WAS emphasized in the preceding note, the maintenance of professional prestige is vital to the integrity of the great engineering societies. For that reason the incident discussed above, the action of the American Society of Mechanical Engineers in joining the National Industrial Conference Board, should be made the occasion of careful reflection on the precautions necessary to preserve the professional standing of these important bodies.

The American Society of Mechanical Engineers needs particularly to be on its guard. It has a large number of members whose position in industry brings them in touch with administrative, financial, and selling problems. Their technical viewpoint is likely to be warped, and there is danger, in consequence, that the society's actions and views will be colored by the commercial point of view unless extreme vigilance is exercised.

The action of the society in taking membership in the National Industrial Conference Board is an instance in point. One cannot conceive such a proposal coming before the Board of Direction of the American Society of Civil Engineers without a very thorough airing of the character and constitution of the conference board and a keen appreciation being formed of the position in which the society might be placed by taking membership. Yet, we are reliably informed, the possibly stultifying position of such action did not occur to the council of the American Society of Mechanical Engineers.

Much the same coloring of view was noted by civil engineers in the preliminary report of the mechanical engineers' aims and organization committee; it was therein recommended that the code of ethics in its existing form be dropped. The recommendation, it will be noted, was qualified, and in the final report was changed to advocate the writing and adoption of a new code. Yet codes, as such, were spoken of by members of the mechanical engineers' committee in such deprecatory language as to be a shock to the civil engineers who had occasion to confer with them.

Obviously, professional prestige is too precious an asset to be guarded in any but the most scrupulous manner. The American Society of Mechanical Engineers would not consciously tamper with it, but is there not some slackening of that strictness which is necessary if that professional prestige is to be maintained unimpaired.

The Railway Problem—I

Public Corporations as a Solution to Secure Efficient Operation and Fair Treatment to

Labor, Capital and the Public

By CHARLES WHITING BAKER

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The new plan for dealing with the railways of the United States here described differs from others in its recognition that efficient operation of the railways depends on the operating officers of the railways and their loyal staffs. Any successful plan must provide conditions which will encourage the energy, initiative and fidelity of these officers.

Congress cannot merely hand back the railways to their owners, without causing a financial disaster without precedent. It must adopt some constructive plan for solving the railway problem.

The supremacy of Federal control of the railways over state control must be established, or economic barriers to interstate commerce will imperil national prosperity and even national unity.

Railway capital must have a fair return; but in order to secure this return it must be relieved of risk from the demands of labor, the exercise of state or Federal control, and the manipulations of financiers.

The control of railway corporations by financiers who exercise the control for their personal benefit must be terminated.

The operating organizations of the railway companies, which are the main reliance for securing safe and efficient railway service, must not be destroyed by unwise consolidation or by too great centralization of Government control.

In order to secure the ends above set forth and at the same time to avoid the dangers of Government ownership and operation, the present railway corporations should be reorganized under Federal charters as corporations to render efficient public service, all profits above a fair return on the capital invested being used for the public benefit, to supply the need for new railway capital and amortize existing capital, so that the proportion of railway property on which no payments to capital will be required will increase year by year.

These public corporations would be managed by directors representing the public, the employees and officers and the stockholders, nominations being made by organizations of these three classes and final appointment being made by a Federal Railway Board. Railway rates would be so adjusted as to pay operating expenses plus the fixed return on capital and leave a surplus, part of which would be available for profit-sharing dividends to the operating force to encourage efficiency.

Voluntary reorganization of present railway corporations on the above basis will avoid litigation and controversy, and conditions are explained which will induce such voluntary action.

The key to such a reorganization will be the creation of a Federal Railway Board with broad powers to guide and to co-operate with these reorganized corporations for public service in carrying on and developing the country's railway system.

I.

Why Congress Must Adopt a National Railway Policy

WITHIN the next few months Congress must either adopt some national policy for dealing with the railways of the United States or order their return in their present condition to the companies which own them.

What does the latter alternative mean? It means that the railway companies would take back properties in which some $17,000,000,000 have been invested and which were worth that on the basis of their earning power two years ago. Today these railways, taken as a whole, have lost the greater part of their earning power. In the first six months of 1919 their net earnings were at the rate of less than 2 per cent. per annum on the capital invested. If current demands for increase of railway wages are granted, even this small return will be wiped out, and a deficit incurred.

But when the roads are turned back to their owners, they can no longer be dealt with as a whole. Each individual corporation will have to take its property and do the best it can with it. A few companies will be able to earn the interest on their mortgage bonds. A much larger number will be unable to do this and will go into the hands of receivers. The stockholders of those companies will lose most or all of their property, and the bondholders a good part of theirs.

Many companies will be unable to earn enough money to pay even their operating expenses. What are such companies to do? They cannot make up the deficit with borrowed money. No one will lend them any money. They have only two alternatives. One is to suspend operations entirely, to the serious injury of the communities which have relied on them for transportation. The other is to cut down train service and every possible expense to the barest minimum, to cut down in safety appliances, to neglect track and rolling-stock maintenance at the risk of train accidents, and thus continue some sort of operation. Of course, the property of those who own stock and bonds of these companies will be

practically wiped out. They will have left only their paper certificates and remote hopes.

The destruction of property which will result if Congress merely returns the railways to the owning companies will not fall on wealthy men alone. The bulk of the railway stocks and bonds are not held by the very rich. They are held by people of moderate means and very largely by the savings banks and life insurance companies which are trustees for the accumulations of many millions of persons. If the value of billions of dollars of railway bonds is destroyed, millions of wage workers will lose a part of their savings laid up for old age or illness.

But the train of impending calamity does not end here; it only begins. What sort of financial crash and business depression will result from the sudden annihilation of ten billions or more of the property represented by railway investment nobody knows; but there is good reason to expect the results to be most serious. Even more disastrous in the long run will be the certain dislocation of railway service. Prosperity for business and employment for labor are absolutely dependent on transportation facilities. Starvation for many millions promptly threatens when the railways cease to operate, as was many times demonstrated during the war. The stability of the Government itself—the nation's security against foreign foes or internal disorders—is put in peril when railway transport stops.

This is the most important reason of all, probably, why Congress *must not* take the simple and easy step of turning back the railways to the owning companies and doing nothing more.

Why Have Railway Net Earnings Disappeared?

But "the man in the street" who, like Mr. Ford, reads only newspaper headlines, says: "I don't see why any such terrible results should follow. It isn't two years since the Government took over the railways. I presume they have been badly managed; but the Government has spent a lot of money, has shoved up freight rates and passenger fares and claims to have introduced economies that will help the railways to save money. Why can't the railway companies take back their roads and go ahead and not have things much if any worse than they were before?"

Probably a large proportion of the average, intelligent business men of the United States who have given no particular study to the railway situation hold similar views. It is of such great importance to the public welfare that these ideas should be replaced by a correct understanding that a discussion is here attempted, covering only the broad general situation, with omission of details.

The chief facts in the situation may be emphasized as follows:

1. Railway net earnings have disappeared because the railways have increased their freight rates only 25 per cent. and their passenger rates 50 per cent. while their "cost of living" has more than doubled in the past four years. A railway company, like an individual, has only the margin between its "cost of living" (operating expenses) and its earnings from selling what it produces (transportation), with which to pay the interest on its debts.

2. Government operation of the railways should not be judged by the present financial condition of the railways. Government operation has been far more successful than is commonly understood; *but such success as it has had has been chiefly due to the use of organizations which had been created by the companies.* Actually, we have had no real trial of Government operation under such conditions as would exist if it were adopted as a permanent policy.

How Changes in the Value of the Dollar Have Hit the Railways

It is astonishing to note what a large proportion of the economic and social difficulties under which we are struggling today result directly from the rapid changes in our standard of value, the dollar, and especially from the fact that the public does not understand these changes.

One does not have to understand economics or theories about inflation of the currency to understand that the value—the "buying power"—of the dollar is varying all the time and in the past three years has had enormous variations.

Economists and a few financiers have known for many years of these variations in our standard of value: but all the rest of us—bankers and merchants and clerks and farmers and all—have supposed a dollar was as stable as a yardstick. The high cost of living—of which the changes in value of the dollar are an index—has now drawn general attention to these changes.

For many years statisticians have been keeping records of the changes in the value of the dollar by publishing so-called "index numbers" which show changes in average market prices of staple commodities. The

[1]Dun's "Index Numbers" are compiled from the average wholesale prices of about 300 standard commodities arranged in seven groups, as follows: (1) Breadstuffs; (2) meat; (3) dairy and garden; (4) other food; (5) clothing; (6) metals; (7) miscellaneous. The price of each of these commodities is multiplied by a figure determined as the estimated per capita consumption of that commodity. The commodities listed under "Miscellaneous" include such articles as coal, petroleum, building material and drugs, so that the individual's expense for fuel and shelter is represented in the total.

TABLE 1.—INDEX NUMBERS COMPILED by R.G. DUN & CO. FROM MARKET QUOTATIONS of 300 STANDARD COMMODITIES, SHOWING VARIATIONS in the COST of LIVING and in the PURCHASING POWER of the DOLLAR FROM 1896 to 1919.

Date	Dun's Index Number	Corresponding Number Indicating Buying Power of $1
Jan. 1, 1896	$77.780	1285
" 1897	75.502	1325
July 1, 1897	72.455	1382
Jan. 1, 1898	79.940	1253
" 1899	80.423	1244
" 1900	95.295	1049
" 1901	95.668	1046
" 1902	101.587	984
" 1903	100.356	996
" 1904	100.142	999
" 1905	100.318	997
" 1906	104.464	995
" 1907	107.264	932
" 1908	113.282	883
" 1909	111.848	894
" 1910	123.434	810
" 1911	115.102	869
" 1912	123.438	810
" 1914	124.528	802
" 1915	124.168	805
" 1916	137.660	726
" 1917	169.562	589
Feb. 1, 1917	176.272	567
Mar. 1, "	186.244	537
Apr. 1, "	190.012	526
May 1, "	208.435	480
Aug. 1, "	218.779	457
Jan. 1, 1918	222.175	450
July 1, "	232.575	431
Oct. 1, "	233.227	429
Jan. 1, 1919	230.146	434
Mar. 1, "	217.037	460
May 1, "	222.193	450
July 1, "	233.707	428
Aug. 1, "	241.650	414
Sept.1, "	238.342	420
Oct. 1, "	235.867	424
Nov. 1, "	238.573	420

accompanying Table I shows the index numbers compiled, by R. G. Dun & Co.' for the period from Jan. 1, 1896, to Nov. 1, 1919. The low point of prices, or greatest value of the dollar, was reached July 1, 1897, when $72.45 was sufficient to buy the standard commodities on which the index number is based. On Jan. 1, 1902, only 4½ years later, it took $101.58 to buy the same amount. In the following 13 years there was a further increase and the index number was $124.18 on Jan. 1, 1915, just before the effect of the war on supply and demand and resultant prices began to be a strong factor. Then prices began to jump; the dollar began to fall off rapidly in value. The beginning of 1916 brought the index number to $137.66. A year later it was $169.56. Shortly after the United States entered the war it passed the $200 mark and it has remained above it ever since. It reached $233.23 in October, 1918, and after some reduction began climbing again and reached a maximum on Aug. 1 of $241.65.

Let us understand what these figures mean. They mean that a wage of $3 per day will buy no more now than a dollar would buy in 1897. They mean that the man who had a salary of $230 a month on Jan. 1 last could buy no more with it than he could with a salary of $124 a month four years earlier.

The Government Railroad Administration has had to deal with a situation that would have confronted the railway companies had they continued in control. Railway labor had to have a higher wage to meet the higher cost of living. The railway brotherhoods and unions demanded it and had the power to enforce their demands. The unorganized railway workers had to have a similar increase or they would have gone to the munition plants, shipyards and cantonments. The price of coal for locomotives doubled and trebled. Steel prices went up to four or five times the normal. And the product which the railways manufacture (transportation) was raised only 50 per cent. for passengers and 25 per cent. for freight.

Suppose—to get clearly in mind what has actually happened—that there was a standard of value which did not change and that all prices were based on this standard instead of on shrinking dollars. Then we would understand that railway wages have not been much increased. They have only been varied to offset the loss in value of the dollar so that the railway employee is getting about the same pay that he was getting 10 years ago. The cost of many railway materials, measured by an unchanging standard of value, did rise during the war and is still above the normal. Finally, the price which the railways get for their product has fallen away down. The increases in freight and passenger rates have not been nearly sufficient to offset the shrinking value of the dollar.

Of course, this is not the entire story. The eight-hour day, the abolition of piece work and other changes which have cut down the per capita output of labor have had a large influence in increasing the amount the railways have to pay out in wages. The Federal Railroad Administration has been partly wise and partly foolish in many matters; but these matters are unimportant compared with the great fact of the shrinking dollar above portrayed.

Let us now see if this thinking in terms of absolute value does not help us toward a solution of some of the serious difficulties in the railway situation. Suppose that railway freight rates, instead of being measured in shrinking dollars, were measured in a percentage of value of the goods transported. It would be a fair proposal, would it not, to pay for carrying to market the coal and iron and beef and cotton and a thousand other goods *the same percentage of their market value* that the railways received for freight on them 10 years ago?

But if that were done the railways would be on "Easy Street." Had that been done during the past two years, Uncle Sam would be counting his profits from his experiment in railway operation instead of hunting for a billion dollars and more to meet his losses.

Is there anything unjust in such an increase in freight rates? Is it not common knowledge that high prices for farm products have doubled the values of farming lands; that oil wells and mineral and metal mines have poured out wealth untold; that manufacturers in every line have reaped big profits? And they have all made part of their profits *by getting their railway transportation*—on which every industry absolutely depends—*at less than cost.*

But Director General Hines, in his review of the railway situation before Congress last Spring, opposed an increase of freight rates "because it would add further to the high cost of living."

Let us see what this argument amounts to. Table II shows the actual railway freight rates in force June 30, 1916, on various standard goods all the way from producing centers to consuming centers. (Since that time the freight rates have been raised only 25 per cent.) It also shows the total increase that would have taken place had these rates been raised 50 per cent. instead of 25 per cent. The table shows that on most merchandise the increase in total cost due to a freight-rate increase of 50 per cent. instead of the 25 per cent. that was actually made would be too trifling a percentage in the price to be noticeable. On such bulky and heavy articles as coal, lumber and ore, where transportation forms a large part of the final cost, the increase would be substantial, and yet it would represent only a small part of the rise in price of these goods which has taken place. The producers and buyers and users of these materials have no right to have them carried below cost at the expense of either the railway owners or the taxpayers.

TABLE II-- RAILWAY FREIGHT RATES FROM MARKETING CENTERS TO CONSUMING CENTERS, IN FORCE JUNE 31,1916.

Commodity	From	to	Miles	cents per 100 lbs.	An Increase of 50% per 100 lbs.
Refined oil	Tulsa,Okla.	Cleveland	980	38.5	19.2 = 1.3 c.per gallon
Fresh meat	Kansas City	Pittsburgh	898	52	26. = 1/4 c.per pound
Cattle	Dallas	Kansas City	484	33.5	16.7 = 1/6 c.per pound
Potatoes	Houlton,Me.	New York	567	30	15 = 8 c.per bushel
Lumber	Winona,Miss.	Phila.	1,160	35	16.5 = 5.37 c.per 100ft.
Oranges	Palatka,Fla.	Pitts-burgh	1,121	62[1]	31. = 31 c.per crate
Grain	Fargo,N.D.	Chicago	640	18.5	9.2 = 4.6 c.per bushel
Grain prod-ucts	Chicago	Balti-more	749	19.5	9.7 = 9.7 c.per 100 lb.
Butter	St.Albans, Vt.	Boston	315	65[1]	32.5 =1/3 c.per pound
Anth. coal	Carbondale, Penn.	Spring-field, Mass.	308	$2.75[3]	$1.38[3]= $1.23 per net ton.
Bit. coal	Cresson,Pa	Chatham, N.Y.	476	$2.40[3]	1.20[3]= $1.07 per net ton.
Iron ore	Ashtabula, Ohio	Latrobe, Penn.	170	.93[3]	46[3] = 46 c. per gross ton.

[1] Rates in effect Jan.1,1919

[3] Rate per gross ton.

If the simple, elementary facts above set forth could be understood by the business men of the United States, the first part of the railway question would be promptly solved. Whether the railways were kept by the Government or returned to the companies, whether they were to

be managed by financiers or managed by the railway employees, as the Plumb plan proposes, their rates would be brought up to a level that would give them a square deal.

This much at least Congress must do if it turns back the roads to the companies. If it does not provide for this, the resulting public disaster will cause many times the loss to the public that the increase in rates would cost.

II.

Why the Supremacy of Federal Control Over State Control of Railways Must Be Established

Congress would like—and everybody else would like—an easy and simple solution of the railway problem. One hears more or less frequently the opinion that the Government ought just to return the railways to the companies and then keep its hands off. Having established the fact that the railways must have higher rates, it may seem an easy solution for Congress merely to instruct the President to hand the railways back to the companies and say, "Thanks, awfully, for letting us use them while the war was on. Now go ahead and run your own business and charge rates high enough to keep yourselves going strong."

Let us see where the railways would be landed by such a benediction. Everybody agrees that the railways should have their rates raised to a point that will meet all their necessities—provided only that the increase applies to the freight shipped by the other fellow! Every city assents to the proposition that higher rates ought to be charged to rival cities; but its own rates must not be interfered with. Each state is willing—and, indeed, anxious—that its neighbor states should pay railway rates that shall be adequate for the railway's needs; but its own officers and Public Service Commission are keen that its own cities and citizens should pay railway rates and have railway service that will give them a competitive position as good as and a little better than rival states enjoy.

The prosperity and unity of the nation have been largely due to the success with which the Federal Government, created by the Constitution, has prevented all barriers to interstate commerce. State control of railway operations tends more and more to raise these barriers and to impair national unity by building up trade rivalries between states.

For the nation's political welfare, as well as its economic welfare, therefore, Congress *must* act on the railway question. It cannot, if it would, turn the responsibility for an increase of rates over to the companies themselves; for the companies themselves, under existing state control, would be powerless to raise rates as promptly and adequately as must be done to rescue the railway companies from financial disaster. Indeed, the rate increases already made will be abolished as soon as the railways are handed back.

The Interstate Commerce Commission is also clothed with authority over rates on all interstate traffic. No one would seriously propose that its authority should be annulled. On the contrary, all agree that Government control over the railways must be extended and made more nearly complete.

Does any one have any doubt about this? Just to settle this point beyond question, let us see what would happen if Congress should take an opposite course. Suppose a majority in Congress should say, "We want no more Government operation or control of railways. We will order the roads returned to their owners and we will take power away from the Interstate Commerce Commission and allow the companies to run their own business and fix their own rates for fare and freight."

Congress might take this course—if public opinion would permit it—but Congress has no power to alter the laws of the fifty sovereign states which make up the Union. The complete abolition of Federal control over the railways would merely transfer entire authority to the states; and they would not be slow to exercise it. The railway companies would be just as powerless to raise their rates as they are under the Interstate Commerce Commission; and there would promptly be inaugurated a carnival of chaos in the competition of the states over railway rates and facilities which would be ruinous to the railways and even more ruinous to the public welfare.

There is, therefore, no beneficial solution of the railway question to be found by abolishing or even relaxing the measure of Federal control over railway operations. On the contrary, the urgent need is that such control be made more nearly complete. The railway corporations themselves and the financiers who control them are asking for this.

Of course, it is easy to raise objections to this course. There are plenty who will declare that the railways are too much regulated already; there are others who will descant on the failings of the Interstate Commerce Commission; the evils of an overcentralized control may be pointed out; but to interpose delay with such objections at this time is like stopping a fire truck on its way to put out a fire because the foreman is incompetent and ought to be replaced by a better man.

In a nutshell, the situation is that Congress has got to establish full Federal control over the railways in order to save them from the chaos of multistate control. The need for this has been growing more evident for years. The huge railway deficit that has developed has produced a critical situation that makes the change imperative.

III.

A Fair Return to the Railway Investor

There is sharp controversy at Washington over rival plans for solving the railway problem. The smoke of the conflict is so thick that it is difficult to see through it and find where the truth lies. The road to a solution of the railway problem obviously lies by way of agreement, however, and substantial agreement already exists on certain basic principles, as follows:

1. The capital actually invested in railways—"every honest dollar," as the advocates of the Plumb plan put it—is entitled to a fair return. There is no considerable faction which advocates wholesale confiscation of the property of the railway owners.

2. The labor which operates the railways is entitled to a fair rate of wages, such a wage at least as could be earned in an occupation of similar difficulty and responsibility where free competition prevails.

3. The rates charged for railway transportation must be at least sufficient to pay to railway capital and railway labor the above-named return. Nobody advocates running the railways at a loss and making up the deficit from taxation.

4. The plan for settlement of the railway problem must provide for the *regular* and *efficient* operation of

the railways. We shall all suffer together—railway owners, railway labor and the general public—from the interruption of railway transport by strikes and embargoes or from waste in the use of material and labor. Most of all shall we suffer if we fail to provide for the constant development and improvement of transportation to meet the growing needs of the nation. At this very time, one important factor in the high cost of living is the failure to develop our transportation network to tap additional sources of food and other raw materials to keep pace with increased demand.

Taking up the first principle, that railway capital is entitled to a fair rate of return, let us see what this involves. Some of the plans offered at Washington propose to have the railway investor protected by a Government guarantee of a certain minimum return on his investment. The majority of the plans, however, recommend a "rule of ratemaking" under which Congress will order rates to be so fixed as to provide railway earnings sufficient to pay a certain rate of return on railway capital. One or the other of these plans must be accepted if railway capital is to receive the square deal to which all agree it is entitled. We must face the fact that the time has passed for carrying on railway transportation as a private business in which the investor bears all the risk of loss and is entitled to all the profits he can make. The risk has become too great to be fair to the capital already invested; and it is so great that new capital can no longer be obtained for railway enterprise.

Further than this, it is not to the public interest that the railway investor should bear the risk. He is entitled to a fair rate of return; but the question of what *is* a fair rate depends very largely on the amount of risk involved. The railway investor today sees his property threatened from one point by public regulation of rates and of the service, which cuts down earnings and increases expenses; from another point by the demands of railway labor, and from a third point by the manipulations of those who control the financial end of railway corporations. If the public frees the railway investor of all risk, railway capital can be had even in these times at a rate of 4 to 5½ per cent., depending on the extent to which it is subject to taxation. If, on the other hand, railway capital must bear the risks above enumerated it must have the prospect of a return of at least 8 to 10 per cent. Indeed, until Congress grants some amelioration of present risks, investors will not go into railways at all.

But neither the public nor railway labor will endure so high a return as this on railway capital. Demands for rate reduction and wage increases will certainly follow where a road earns such profits as 8 per cent. or more. The conclusion is inevitable, therefore, that railway capital can only receive a fair rate of return by accepting a fixed rate in lieu of standing the risk of losses for the chances of profit.

And railway investors are willing and anxious to do this. The principle is definitely recognized in most of the plans offered at Washington that if capital is to be assured of a fair rate of return—or, in other words, is to be relieved of all or most of its present risk—it will no longer be entitled to earnings above this fair rate of return. Such excess earnings it is proposed in most of the plans to divide between the railway employees and the public. Such excess earnings will be due in part to faithful and efficient service of the employees and officers and in part to the rates for transportation being fixed higher than necessary. Such a division is, therefore, entirely equitable.

A unique feature of the Plumb plan, backed by railway labor, is that railway officers are to have twice as high a rate of participation in such profit-sharing distribution of excess earnings as the rate allowed to the rank and file of railway labor. This is surely a step in the right direction, for where efficiency and economy in the service are obtained it will be due more largely to the energy and initiative of the officers than to the routine work of the employees.

It is true that in some of the plans presented it is provided that the railway companies may keep a certain proportion of the excess earnings. In the National Transportation Conference plan, for example, it is provided that a railway company may distribute one-third of its excess earnings to its stockholders. Furthermore, in this plan the individual railways are not fully relieved of risk, and the rate of return on railway capital is therefore set at 6 per cent., a rate considerably higher than would be necessary if the risk were made smaller.

The argument is made in defense of this that unless railway companies are under some risk of loss and have some prospect of profit, they will have no incentive to operate economically. Why bother to keep down expenses and keep up earnings if the rates are to be so manipulated as to yield a certain dividend anyway, and no more than that dividend could be received no matter how efficient the operation?

This argument is sound, provided we are to carry on railway transportation as a private business conducted for profit. But with such a degree of Government regulation as is now agreed upon as essential, and with the control and limitation of profits above specified, there is grave doubt that this will be possible. There is a further flaw in the argument in the assumption that the efficiency of railway operation has been caused by the railway stockholders' desire for dividends. No diagnosis of the railway situation is complete and no remedy for railway evils is complete that leaves out of consideration the fact that the stockholders who own the railways no longer control their property.

IV.

The Control of Railway Property; Theory Versus Facts

Most of the discussion at Washington of plans for solving the railway problem proceeds on the assumption that the railways are to be returned *to the control of their owners.* The real owners of the railways, however, are not the corporations which hold the title to the railway property, but are the millions of persons who either own railway stocks or bonds outright or own them indirectly through savings bank deposits, life insurance policies or interests in other concerns owning railway securities. It is these persons whose property rights must be safeguarded; and we must squarely face the fact that these owners of the railways long ago *lost all control of their property.*

The holders of railway bonds have, of course, nothing whatever to say concerning how the property on which they hold a mortgage is managed; and, as a practical matter, the holders of stocks have no greater voice. In theory, the stockholders of railway corporations elect the directors, who in turn conduct the operations of the company; but that theory long since ceased to have any basis in fact. What choice does the individual stockholder among the 100,000 men and women who own

stock in the Pennsylvania Railroad Co. exercise in the selection of its directors? He may execute the proxy annually sent to him by the management, authorizing certain men, of whom he has never heard, to vote in his stead for such men as they choose for directors; or he may throw the proxy in the waste basket. It makes no difference in the final result. And this is true not only of small stockholders but those with large holdings; and it is true not only of the Pennsylvania but of practically all railway corporations save a few very small ones of trifling importance in the transportation field.

There are, of course, exceptions where families of great wealth, or combined interests of large amount, hold large blocks of stock and are able to control the election of directors; but the case is no better here. Experience has proved that where control is so held it is quite apt to be administered for the benefit of the interests in control instead of for the benefit of the stockholders as a whole.

In theory, again, the elected directors control the corporation and are responsible to the stockholders for its conduct; but actually the directors seldom concern themselves with anything more than the finances of the corporation and often not even with those. Directors are selected by the financial interest or group which controls the corporation, although the actual ownership of stock by this group may be trifling. These directors merely ratify the plans and policies decided upon by the group in control. Directors' meetings are often as perfunctory as stockholders' meetings. They are held under the guidance of the corporation attorneys merely to comply with the legal formalities deemed advisable to ratify plans previously decided on.

It is, of course, true that in other great corporations besides the railways the control has passed from the hands of the owners to a small group of financiers; but with the railways the situation has become so acute that no plan for solving the railway problem can leave it out of account. The business of railway transportation is a natural monopoly. There can be no competition in it, such as prevails in a manufacturing or commercial business. The necessity of regulation of the railways and all other needed public utilities, to protect the public, is now everywhere recognized. The great mass of public-utility laws now in force all testify to the fact that the carrying on of public utilities is not a private business but a public business, affected with obligations that do not apply to any business in which competition is possible.

There is no need for drawing a sensational indictment of the financiers who control the country's railways. They are no worse than the generality of men. Indeed, we may go farther and say that most of the railways of the country are managed, by the financial interests in control, with fidelity to the interests of the stockholders as a whole. The exceptions, however, are so numerous and so glaring and the results are so disastrous to the owners of railway stock and bonds that any plan for solving the railway problem must provide protection for railway capital from the dangers of "high finance."

This is indeed recognized in some of the plans now under discussion, usually by a provision that all issues of railway securities must hereafter have the approval of some Government board. But will this be effective? Will any plan be effective that permits the railways to continue in control of men *who secure that control for what profit they can make out of it?* The financiers who control our railway systems are not engaged in business for their health, nor are they bothering themselves with railway affairs from philanthropic motives. The control of a great railway corporation carries with it possibilities of great profit without going beyond acts which are strictly legal.

Those in control of a corporation have an inside knowledge of the values of its securities and of the events that raise or lower these values—a knowledge that the ordinary investor or speculator does not possess. A director has a perfectly legal right to buy and sell shares of the company under his control. He receives nothing in return for the responsibilities involved in his director's office, save the nominal fees for attendance at directors' meetings. He may therefore consider the advantage he gains in stock purchases and sales, or in commissions on the sale of bonds and notes, as a legitimate recompense for his services as a director.

This is only a beginning of the ways in which control of a great railway corporation may be made to yield profits. The railways purchase more than $1,000,000,000 worth of supplies annually. They let contracts for many millions of dollars' worth of construction. Branch lines are bought and sold; subsidiary concerns are undertaken or wound up. In all these affairs huge competitive interests are involved. The financial group with which the final decision lies stands to profit directly or indirectly by these decisions, and its profit is limited only by the elasticity of its conscience, for there is no one to question its acts.

It is true that graft in the railway business is far less prevalent today than it was a generation ago. Some long standing sources of railway graft such as transportation rates to shippers favored by the financiers in control, have been pretty well eliminated. Yet so long as cause produces effect, the continuance of the existing system, which makes it easy for a group of financial buccaneers to obtain control of a railway property and loot it, will produce crops of financial scandals as regularly as the seasons roll around.

Of course, the railway investor tries to protect himself by buying stock in concerns where the control is reputed to be held by banking houses of high standing; and someone may defend the "financier control" of railways with a eulogy of the ability and honor of such financiers. How will such a eulogy sound to the owners of New Haven stock who bought it for years as they would Government bonds because it was controlled by the most famous banking house in America? At this time a suit is pending against former directors of the New Haven for the recovery of $150,000,000 alleged to have been lost to the stockholders through their malfeasance. The suit is opposed by the present board, so that the individual stockholders have to bear the burden of its prosecution. And the New Haven is only one of a long, long list extending back to the names of corporations and of men that are now only a shadowy memory. What stories of recent losses by investors are brought to mind by the names of the Pere Marquette, or the Cincinnati, Hamilton & Dayton, or the St. Louis & San Francisco, or the Baltimore & Ohio!

Long experience has proved that resort to the courts is no remedy for the evil. Such suits as that against the New Haven have never restored to stockholders the money wrongfully diverted from them. Let no one deceive himself, either, with the idea that all these financial scandals are past history and that the financiers now and henceforth in control will refrain from using that control for their own benefit. Cause and effect will operate in the future as in the past. Just so long as law and custom permit men to secure control of railway com-

panies for the direct purpose of making what profit they can out of it, just so long will great profits be reaped at the expense of the railway investors and the public.

But it may be said this control of the railways by Wall Street is no new thing. Why must it be altered now as part of the solution of the railway problem? The reasons are as follows:

1. It is agreed that a fair return to the railway owner on his capital actually invested must be a cardinal feature in solving the railway problem. Rates must be so fixed as to yield such a fair return; but the public will not endure rates high enough to compensate the investor for his risk of loss from the manipulations of the financiers.

2. It is argued in defense of the financiers that they have at least endeavored to operate the railways economically. They usually tried to keep down wages and expenses in order to increase the net earnings available for dividends. But if rates are hereafter to be so fixed as to yield a certain rate of dividend anyway, where will be the incentive for the financiers in control to save money? Will there not be an inevitable tendency to let off the brakes; to spend money for this and that where the expenditure will bring some benefit to the financiers in control? There will not be hereafter even the slight restraint of accountability to stockholders that has previously existed. Since the stockholders are assured of a return anyway, what will they care how their property is managed?

3. These are times when it is extremely important to defend the rights of property. It is a worth while achievement to secure acceptance of the principle that the owners of the railways are entitled to a fair rate of return on the fair value of their property. It will endanger this acceptance if we attempt to include in "fair value" what should not be included.

Under present control by financiers, railway capital is based on earning power; hence, the higher railway rates are raised, the greater the capitalization that can be issued upon a property. This may be defensible so long as railways are carried on as a private enterprise for their owners' risk and profit, but it becomes impossible as soon as we accept the principle that rates must be made sufficient to yield a return on the capital issued.

Manifestly, the fair value of a railway, on which it is entitled to earn a fair return, cannot be justly based on its earning power, since that in turn depends on the rate charged.

4. The question, What is the fair value on which the owners are entitled to a fair return? is a very difficult one, and the chief source of the difficulty is the financial methods of those who have hitherto controlled the railways. We cannot even pay a return on "every honest dollar" invested in the railways as the Plumb plan proposes, for many hundreds of millions of honest dollars contributed by honest investors have been lost in unproductive enterprises due to the ignorance, or worse, of the financiers in control.

It is impossible now to retrieve the errors of the past. We cannot search the titles of present owners of railway stocks and bonds and declare a flaw because, somewhere back, a moral fraud was involved in their issue. What we must do is to *see that railway capital hereafter issued shall fairly represent "honest dollars." We must take railway control out of the hands of those who have made profits by converting the "honest dollars" to their own use.*

It would seem too obvious to require proof that the desired end cannot possibly be attained merely by placing restrictive powers over the issue of new capital in the hands of state or Federal commissions. We have been trying that scheme on a larger or smaller scale for a dozen years, and it has been a dismal failure. Why should we expect it to succeed? How could half a dozen men at Washington possess such omniscient knowledge of the schemes hatched in connection with the administration of railways 300,000 miles in extent as to prevent misuse of stockholders' property? And if these half dozen men built up an organization of inspectors and clerks and supervisors in the attempt to prevent the evil practices just described, it is easy to foresee the antagonism and distrust and friction which would ensue. The execution of stringent cast-iron laws, and the delay in acting on cases, might cause even more harm to the transportation business than the benefit that would accrue.

[*Concluded next week.*]

Full-Length Smokejacks in New Roundhouse

In building a new roundhouse at Haselton, Ohio, recently, the Pittsburgh & Lake Erie Ry. equipped the engine stalls with smokejacks covering the full length of each stall. This not only allows for variation in the position of the locomotive stack and provides direct venting for steam, but also takes care of the smoke and steam while the engine is entering or leaving. As the main structure of the roundhouse is of steel, the accumulation of corrosive gases and moisture under the roof would be particularly harmful. The length of smokejack over each stall is divided into three hood sections, tapering up a separate stack. The stacks are about 5 ft. square. Hoods and stacks are of wood, 1-in. sheathing on a frame of studding. Each stack is equipped with a damper operated by a cord from the floor, except that the damper nearest the entrance door is interconnected with the door so as to open when this is swung open. Two other constructional items are the premolded gypsum roof slabs and specially designed swinging doors. The roof slabs about 8½ ft. long between purlins, are laid parallel to the axis of the stall space over which they are located, and the irregular areas thus left between adjoining stall sections are covered by slabs laid transversely and cut to fit on the job. The doors, which are of wood, have a 3-in. steel pipe the full length of the jamb edge, held to the door itself by four straps bolted to the wood and pinned through the pipe. At top and bottom the pipe projects beyond the door leaf and enters sockets in the frame.

Motor Haulage of Milk Into Detroit

It is estimated that 13,780 gallons, or 1378 cans, of milk daily are hauled into Detroit, Mich., by motor trucks from four outlying communities. This development has come about through the inability of the railroads to give proper service to the outlying districts. Six or seven years ago it was necessary for the farmers to rise very early to take their milk to the railway station, and finally, by changed schedules, the hour was made much more inconvenient. This offered an opportunity for the firm of Wilson & Son, which now operates a fleet of 15 Federal trucks hauling from 12 stations, of which Milan, 42 miles from Detroit, is most distant. Large tractors, with semi-trailers which will hold 204 cans, or 11.2 tons, are used to haul the milk. At peak output, it is often necessary to add an additional trailer.

Beginning a series of interviews with contractors:

Construction Labor's Instability

An Analysis---

I—In which W. J. Morrissey of MacArthur Brothers Company Blames Extensive War Work for Unrest and Decreased Efficiency—Welfare Work May Improve Conditions.

WHAT is the matter with labor, specialized and common; union and non-union? What of its demands for higher wages and shorter hours? Are they equitable? Why does labor continue its radical requests? What can be done to stabilize the situation?

These and other pertinent questions revolve daily in the minds of contractors whose business demands employment of large bodies of skilled mechanics and common laborers. In the following conversation overheard while a passenger on a train passing through a small Hudson Valley town, William J. Morrissey, an executive of MacArthur Bros. Co., New York City, finds the best analysis of the laborer's state of mind. The train had stopped. Several laborers, of foreign extraction, came into the smoking car.

"How much are you getting?" queried the first laborer.

"Forty-five cents an hour," was the answer.

"I'm getting 56¼ cents," was the first laborer's comment.

"You're both pikers," came from a third. "I'm getting 60 cents an hour, but I am no *common* laborer, I'm a *material handler.*"

The laborer, according to views which Mr. Morrissey expressed in an interview with *Engineering News-Record's* representative, has acquired a nervousness due to a condition existing during the war emergency. The war created a labor shortage. It also gave rise to a general, though, as Mr. Morrissey asserts, an erroneous idea that the contractor was making huge profits from war construction. The laborer's idea of a cost-plus-percentage, fixed fee, or sliding-scale contract was a gold mine for the contractor, and, jealous of the fancied immense profits he was aiding to secure for the contractor, the laborer set about to get his "slice." Such men in labor circles were known as "gold diggers." The results were demands for increased wages. The labor shortage made him confident of being guaranteed steady employment, interrupted only by the few days of drifting from one job to another, in the hope that he might get more. He felt independent of any particular contractor for his livelihood, and this, coupled with the feeling that every time he raised a hand he was making large profits for the contractor, sowed the seed of the instability now generally felt.

Replying to the question as to whether labor received more wages now than it was reasonably entitled to, Mr. Morrissey said it was perfect equity for the wages to increase proportionately to the cost of living. In his opinion labor's increase had generally equalled the increased cost of living, but where the large employer of common labor is now losing is through the decreased efficiency of labor's efforts. The endless shifting about of common labor on wartime construction he believes has so impaired the efficiency of a laborer's effort that while the wages now paid approximate the same in actual purchasable value as pre-war wages, the value of his labor is way under pre-war efficiency. "If the cost of living has in the past few years advanced 75 per cent., then wages should have advanced accordingly," says Mr. Morrissey. "But it is obviously wrong that such an advance in living costs should bring labor 100 per cent. increase in wages, or that it should give but 50 per cent. efficient service with a 75 per cent. wage increase."

Another thing the matter with labor is the fact that the common laborer no longer wishes to be thought of merely as a common laborer. Pre-war construction never knew such minute classification as now obtains. During the war a man who never did anything but handle a pick or shovel dropped that pick or shovel and went into some shipyard or to some other center of construction where his otherwise common labor was rewarded with a title or classification. The minute he felt himself no longer a common laborer he considered his efforts worth greater compensation. So intensified became that system of labor classification that the common laborer almost ceased to exist. To use Mr. Morrissey's summation of the situation: "The minute you put a pair of rubber boots on a man he is no longer a laborer but a trench digger, sewer man, or what not, and as such demands more money."

Mr. Morrissey freely admits the equity of the principles of labor unionization, though there are union activities in the building trades for which he finds censure. Unions, seeing the labor shortage during the war, recruited their forces from all classes, the following incident serving to illustrate not an uncommon practice: A certain tailor was recommended to Mr. Morrissey for a job. His qualifications for building construction were a desire to take advantage of high wages, thereby bettering his financial condition, and a fancy that he could use a skilled workman's tools. His case came direct to Mr. Morrissey, who would not employ him because he was not a skilled mechanic. Had that tailor gone to an unprincipled union business agent, as unskilled workmen seeking better employment often did, paid his union initiation fee, bought himself a second-hand set of tools, he would probably have secured employment as a skilled mechanic. Such a business agent would tell the steward of the particular trade the situation, he would tell the foreman, who would tell the other workmen on the job to protect the newly acquired union "skilled" mechanic. Given such protection the tailor-mechanic would, nine times out of ten, have gone undiscovered, unless his work happened to be personally inspected by the superintendent. Such cases did happen where unions were not particular in picking skilled labor. The emergency was present. The demand for skilled building mechanics was great, and the end justified the means, in the union man's estimate of the situation. Because of the inclusion in their ranks of such unskilled "skilled" mechanics, the other workmen frequently adjusted their efforts to those of the newcomer, a fact that in no small measure contributed to the general fall in the efficiency of labor's efforts.

Mr. Morrissey finds that, because of the labor shortage, the common laborer is no longer amenable to the treatment that he was best managed by years ago. He

is a great believer in the old system of "the big boss" knowing all his workmen personally in so far as is possible, yet he is not now so sure that to go out onto a job, greeting this and that workman with a smile and calling his first name, is the best way to treat the workman. In some cases such treatment now makes the superintendent appear "soft." Neither do "gruff and hard" tactics secure best results. All of which is resolved into the assertion that in the treatment of workmen the superintendent has as diverse cases to study as he has workmen employed. Since most of his common labor is foreign the task is doubly severe, though increasingly interesting.

As to the employment of skilled, unionized labor, the chief difficulty is securing wage contracts which are enduring. When a bid is made upon a piece of work that may extend over a period of months, or perhaps years, the contractor has no assurance of the stability of skilled labor wages. He has not, for instance, the assurance that, though he may have a contract at present for a class of skilled labor at $1 an hour, such a wage scale will endure during the life of the contract. Wage demands are contingent upon cost of living and other factors and for that there is little help beyond a certain point.

Admitting, then, the general instability of labor, its often excessive demands, the volatility of its temper and its low percentage of efficiency, what remedial measures are possible? To this question Mr. Morrissey suggests that up to a certain point, granting that the standard local scale of wages is being paid, you can satisfy labor through the supply of comfortable living quarters, attractive meals and places in which to serve them, sanitary camps, and divers wholesome amusements. Extensive installation of such aids to comfort for the laborer is only possible on large jobs where the construction is to be carried on for a considerable length of time. Short jobs, though isolated, would not warrant large expense along such lines. Mr. Morrissey believes in the mental healing effect of comfortable sleeping quarters, proper bathing and sanitary facilities, good food well cooked, and wholesome entertainment. These can be provided within the confines of a large isolated job, so that the nearest village with its usual cheap amusement halls and saloons has no attraction for the laborer. If the laborer is a church member he usually finds a church of his denomination nearby, even in remote places. If the scale of wages paid is the standard local one, with the provisions of good quarters, clean, palatable food, sanitary conditions throughout the camp, comfortable mess halls, showers, pool and billiard halls, moving picture theaters, and reading and writing rooms, you have done about all you can toward stilling labor's restless spirit, thinks Mr. Morrissey.

Not only does the instability of his own labor directly influence the contractor in his bidding, but labor's general unrest, seriously affecting every industry it touches, furnishes the contractor a second worry since the prices of materials with which he builds vary so in cost. Therefore, inasmuch as labor produces the materials for building construction, the instability of labor is the tap root of construction risks, is Mr. Morrissey's judgment.

The possibility of each contractor holding his skeleton construction organization from one job to another, allowing him to recruit rapidly his construction forces once a job has started, has given the contractor a measure of assurance as to the quality and stability of his employees. Workmen, from the laborer in the gang through to the superintendent, often are found from one year's end to the next with the same contractor. The situation is explained through his attraction by that contractor's particular style of management and administration, though it does not concern a majority of the day laborers, as is indicated by the fact that the monthly labor turnover on large construction jobs where thousands of men are employed will usually average 300 per cent.

Mr. Morrissey has given his answers as to "What is the matter with labor?" To its general unrest he ascribes a state of mind developed through intensive war construction wherein the laborer viewed with envy contractors' fancied excessive profits, and realized his power through the scarcity of his numbers. He agrees that certain of its demands are equitable. Wages should advance along with the cost of living. He sees why demands continue, for the laborer is not easily dispossessed of his notions, nor does he wish to relax his hold upon his powerful position.

But the final question, "What can I do to lend stability to the situation?" is but partially answered. Profit sharing? "It never will operate on contract work." Prizes and bonuses? "That has been tried in some cases with good results, though if a habit it becomes a mere wage increase." Government wage fixing? "I don't believe that's the answer." Then is there real truth or not in Mr. Morrissey's laughing comment that "The solution is known only to the Lord and He won't tell!" Speaking more seriously he added: "I believe that the subject under discussion is worthy of the serious consideration of every one affected by the existing conditions—both employer and employee. Any satisfactory solution which will tend to alleviate the present condition is desired by the two classes mentioned and by the public at large. The welfare of the whole country is at stake, and the sooner labor is stabilized the better it will be for all concerned."

Tile Drainage for Iowa County Highways

Untiled Areas of "Seedling Mile" Concrete Road Cracked, While Later Sections Laid With Tile Remained Intact

By James A. King
Mason City, Iowa

EXCELLENT lessons in drainage for hard-surfaced, or paved roads, are furnished by the 16-ft. concrete pavement connecting Mason City and Clear Lake, Iowa. Here are found the comparative results of draining, and of not draining, before paving—which is the most conclusive evidence in the world.

The road runs through a comparatively level country at the western edge of the Iowa drift area, and its general topography consists of a series of low level stretches, and of higher level stretches or plateaulike areas, with gentle slopes connecting the two levels of flat areas. Practically every acre of the land along this highway needs tiling to give full crops of complete maturity every year; though the average farmer will dispute this statement when considering much of the farm land. Experience shows that every rod of the roadway should have been tiled before the paved surface was laid. But the road commissioners, and the engineer in charge of the work, did not know this when they laid the first stretch.

A "seed mile" of paving on this road was completed in 1912. This mile of road crosses a low, level area, but at each side of this area the original pavement

mounts a gentle slope leading to the higher levels to the east and the west.

Where the road crosses the low flat, a grade was built up about 3 ft. high, leaving a deep, open ditch on both sides of the pavement. No tile was put on either side of this road, even down in the low flat. The supposition of the builders seems to have been that no subsurface drainage was needed on the slopes, and that the high grade and open ditch at either side in the low area would give sufficient drainage there. The grading was done in 1911, and the road was left as a dirt road for one year so that the grade would become thoroughly compacted by the heavy traffic.

PAVEMENT ON UNTILED SECTION AFTER FIRST WINTER

In 1912 the concrete surfacing was applied without reinforcement and with expansion joints every 32 ft. That winter, as the ground froze, the center of the pavement heaved. A large, longitudinal crack was formed along approximately the center line of the pavement, more or less irregular and with ramifying branches toward the side. This heaving and cracking was just as serious on the two slopes leading down into the low flat as it was across the flat itself, as shown in the illustration.

In 1913 tile were laid along both sides of this pavement. Surface intakes were placed in the low spots of the side ditches. Since that time there has been no further heaving of this piece of road, and no more cracks have developed in it.

In 1914 the mile of road immediately east of the "seed mile" was paved. The middle stretch of this mile was high ground; the builders thought it would not need tiling, and so did not lay any tile. Both ends of it were comparatively low ground and so, guided by their experiences with the "seed mile," they laid tile ditches there. That winter the untiled stretches of this mile of road heaved and cracked just as badly as had the "seed mile." Consequently, these were tiled the succeeding year. Since that time no further cracks have developed in it.

In 1916, 1¾ miles of road were paved just to the west of the "seed mile." Every rod of this stretch of road was tiled before the paving was laid—the lesson had sunk home. One 80-rod stretch was on a slope which was springy and spouty. The line of tile on each side of the grade did not cure this completely, so a third line was placed right down the middle of the crown. This stopped the seepage which had kept the crown wet and soft.

Probably a cross-cut string of tile placed above this springy spot would have done as well, and would have been cheaper. By cross-cutting some little distance above, and putting the tile clear down to the impervious layer which caused the seepage, all trouble-making water would have been caught before it ever reached the surface on the slope. In the three winters which have elapsed there has been no heaving and cracking on this part of the road which was tiled before it was paved.

Contracts were let in 1917 for paving the remaining section of this road between Mason City and Clear Lake. The last part was laid in 1918. Every rod of stretch of the road was tiled before the paved surfacing was applied.

When the ground froze last autumn (1918) it was more saturated with water than it has ever been at that time in this northern section of Iowa. The continued heavy rains of October and November filled the soil so full of water it could hold no more, where underdrainage had not been supplied. The first permanent freeze came right on top of a bad rain. This sealed the water in the soil, and it stayed there until the spring.

But there was no heaving and cracking along this newly-laid section of pavement. If ever conditions would cause heaving and cracking, they would have been caused last winter. But they did not occur. The tile prevented them. As fast as the water ran off the crown of the road and the adjoining fields into the surface ditches at the roadside, the surface intakes conducted it to the tile, and these carried the water away.

It did not have a chance to seep back under the pavement and heave it when frost reached it. That road will stand smooth and unbroken from heaving so long as these tile continue to do their duty.

These experiences prove indisputably the importance of tiling as a part of paved-road construction. Not a rod of paving should be laid unless it has a tile ditch along both sides of it—at least where a road runs across a level flat, and where it runs up a slope. If the road runs along a side hill, it may be sufficient to have a tile ditch only on the up-hill side. But even then, surface intakes should be placed in each low spot of the down-hill surface ditch with cross-cut tile ditches to conduct the surface flow across into the longitudinal tile ditch.

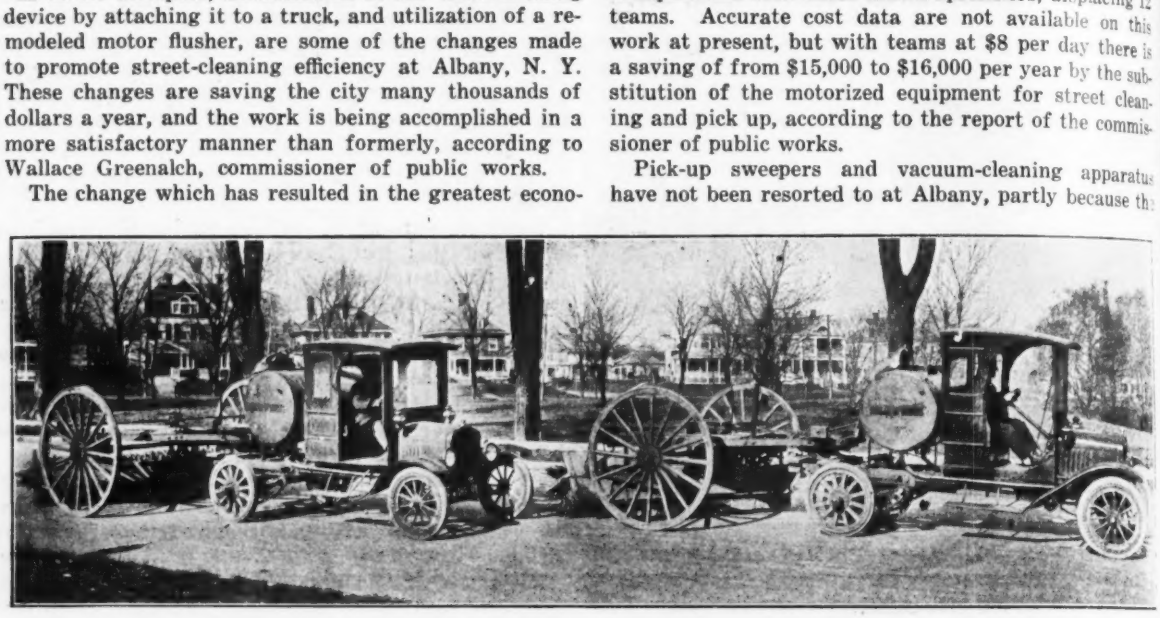
Where a community is spending the amount of money necessary to pave a road, the additional expense of a longitudinal tile ditch on both sides of the road for its full length is so slight that the community cannot afford to take the chances of injuring any part of the road by not laying this second tile ditch. Thorough drainage should be written into one of the very first paragraphs of the specifications for any and every paved road.

Savings Made by Motorizing Street Cleaning Equipment

At Albany, N. Y., Horse Sweepers Transformed by Attaching Ford Tractors—Truck Used With Sanding Device—Power Flusher Remodeled

TRANSFORMATION of old horse sweepers into motor sweepers, motorization of the street-sanding device by attaching it to a truck, and utilization of a remodeled motor flusher, are some of the changes made to promote street-cleaning efficiency at Albany, N. Y. These changes are saving the city many thousands of dollars a year, and the work is being accomplished in a more satisfactory manner than formerly, according to Wallace Greenalch, commissioner of public works.

The change which has resulted in the greatest economy is the motorization of street sweepers. A combination of the old horse sweepers and Ford tractor trucks has been substituted for horse and hand sweeping. This was accomplished by removing the front wheels from the old horse sweepers and connecting the rear or sweeping part to the tractors by means of what is known as a fifth wheel or horizontal turntable.



OLD HORSE SWEEPERS MOTORIZED BY SUBSTITUTION OF FORD TRACTORS FOR HORSES

The tractors are equipped with a 175-gal. tank which furnishes water to sprinkle the street in front of the revolving brooms. Originally the spraying apparatus was placed at the rear of the tractors, but this was found to be so close to the brooms that there was not sufficient time for the dust to absorb the water and lay it before the brooms picked it up. To overcome this the spray was moved to a point just behind the front wheels, where it may be seen in the illustration. The pipe running along the side of the truck supplies the water.

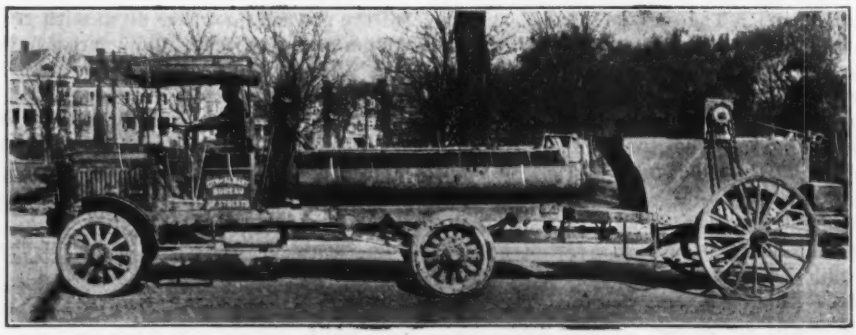
In forming the combination, the only changes needed were the addition of the fifth wheel, after removal of the front truck and placing of a smaller driving sprocket to reduce the broom speed. At the present time the city has seven of these combinations, and they are reported to be giving the greatest satisfaction.

In operation they make from 24 to 33 miles in 7½ hours, sweeping a width of 7 ft. This is at the rate of from 3.7 to 5 miles per hour. It is estimated that six motor sweepers will do the work of eight horse-drawn sweepers and four horse-drawn sprinklers, displacing 12 teams. Accurate cost data are not available on this work at present, but with teams at $8 per day there is a saving of from $15,000 to $16,000 per year by the substitution of the motorized equipment for street cleaning and pick up, according to the report of the commissioner of public works.

Pick-up sweepers and vacuum-cleaning apparatus have not been resorted to at Albany, partly because the men that work at pick-up are needed for the snow-removal force in the winter, and it is desired to keep them employed the year round. A shop for repair of street brooms has also been added to the plant.

Another piece of street equipment which has been motorized is a street-sanding device. It consists of a motor truck with the sander attached, as shown in the view. The truck is loaded with sand, and the spreader is replenished as it becomes empty. Sand is thrown out radially from the cone under the spreader which is operated from a sprocket and chain on the axle. This combination makes a speed of about four miles per hour and spreads for a width of about eight feet.

Some time ago a motor power flusher was added to the equipment. This was of the Hvass type, and worked very satisfactorily, with the exception that the engine appeared to be overworked when driving both the pump and the truck. To overcome this it was decided to remodel it substituting a Tiffin pumping unit. In this connection it may be noted



STREET-SANDING DEVICE ATTACHED TO MOTOR TRUCK WHICH CARRIES SAND

that Albany is a city having many thoroughfares of steep grades.

The tank was moved back on the chassis to give room for the new engine and pump, which handle the water entirely independent of the driving engine of the truck itself. This arrangement made it very hard for the driver to tell when his water pump was acting properly, and it was apt to race when the tank became dry, thus causing injury to the pumping outfit. To overcome this, a pipe was run from the tank to a point near the electrical connection for the magneto of the gasoline pumping engine. This pipe has a float at its upper end which is attached to an ordinary telegraph operator's key. The connection is so arranged that when the float drops as the tank becomes emty, the magneto spark is grounded, thus stopping the pump automatically. Another change made in the flusher was in the cooling system of the pump. This is directly connected with the discharge line from the pump, thus keeping the cooling water at a constant temperature and eliminating the necessity of utilizing space in the tank for a cooling reservoir which would gradually become heated.

A motor catch-basin cleaner is also being tried out, but up to the present time has not been accepted by the city on account of mechanical defects. The department feels that these basin-cleaning devices are bound to come into greater use, because it is increasingly hard to get men to perform this kind of disagreeable work by hand.

Street cleaning at Albany is directly under the supervision of Mr. Greenalch, with W. J. Coffin as deputy commissioner.

Washing Sewage-Filter Gravel at Clinton, Massachusetts

Dirty Material Moved to Washer by Drag Scoops and Hauled Back by Same Means—Cost $11.75 per Cubic Yard

REMOVING, washing and replacing the upper 6 to 10 in. of gravel in sewage filters, in somewhat the same way as slow-sand water filters were renewed in the earlier days, is being practiced on the sewage filters of Clinton, Mass. The filters are maintained by the Metropolitan Water and Sewerage Board in connection with the water-supply of Boston and its vicinity. The beds have been in operation for a number of years, and their upper portion has been filled with organic matter and the efficiency of the filters reduced. No suitable gravel for renewing the beds is available in the neighborhood.

The first gravel washing was done in September to December, 1918. A second bed has been renovated this year, and work on a third one was well toward completion early in September, 1919.

The bed washed in 1918 is about 200 ft. square and has an area of 1.02 acres. A one-horse drag scoop was used to rake up the dirty gravel and convey it to the washer, which was moved along as work on cleaning strips, 50 ft. wide, progressed. The washing plant is thus described in the annual report of the Metropolitan Water and Sewerage Board for 1918:

> The gravel-washing plant consisted of a No. 1 Stocker gravel washer, driven by a belt-connected 2½-hp. Alamo gasoline engine mounted on a wooden frame and moved about on wooden rollers; a small portable pumping unit consisting of a Swaby centrifugal pump with a capacity of 75 gal. per minute operated by a 1¾-hp. Brownwall gasoline engine. About 450 ft. of 2½-in. fire hose was used between the pump and the washer for conveying the washing water, and wooden troughs were used for disposing the dirty water from the washer. The cost of this outfit fully equipped and set up ready for operation was $630 for the apparatus and $125 for labor, making the total cost $755.
>
> The Stocker gravel washer consists of a steel cylinder 8 ft. long and 30 in. in diameter, to the inside of which are riveted steel angles running lengthwise of the cylinder, about 3 in. apart. Hung from an independent frame inside the cylinder are a number of sheet steel chutes, the inclination of which may be varied to meet the requirements. The dirty material is fed into the revolving cylinder at one end and conveyed through it by alternately dropping down the chutes and being carried up again to the next one by the angle strips. The clean water enters at the other end of the cylinder and passes slowly through the washer in the opposite direction to the material. In this way the material gets several washings and scourings, each time with cleaner water, until finally the dirty water and material washed out of the gravel is discharged at one end and the clean material at the other end.

The dirty gravel was shoveled into the hopper of the washer. The washed gravel was shoveled into piles and then moved back into place with the drag scoop, after a harrow had been employed to loosen up the bed.

Some 1100 sq.yd. of material from the first bed was washed. The loss of material was about 20% by volume, of which 75% was the organic matter and sludge that had clogged the bed and a small percentage was sand grains in the gravel.

Seven men and one horse were employed all the time, and two men and one horse extra while regrading was done. The work cost $755 for plant and $1891 for labor. Assuming that the plant will serve for 20 beds, the plant cost per bed would be $38, the report states, and the cost for the first bed cleaned would be $1930, or $1175 per cubic yard. Plant improvements to reduce labor would decrease the unit cost.

After the first bed was cleaned the sewage entered it "freely when applied in doses of 62,000 gal. in 30 min. at intervals of 1.6 days," or at a rate of about 38,000 gal. an area a day, and dissolved oxygen was again found in the effluent.

W. E. Foss is chief engineer of the Metropolitan Water and Sewerage Board.

Three Planning Commissions in One City

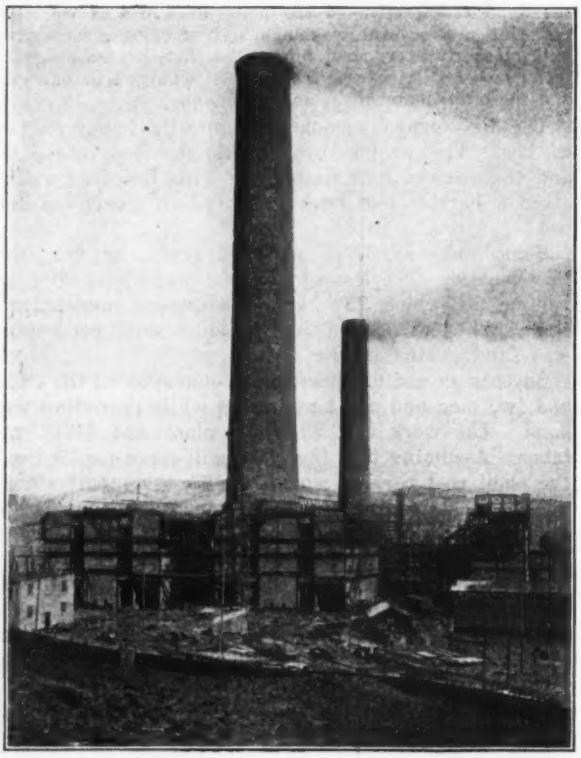
City-planning problems in Pittsburgh are at present being dealt with by three different bodies, in addition to the city Department of Public Works and the county engineer's office. There is a City Planning Commission of nine members, appointed by the mayor; a County Planning Commission of some 25, appointed by the county commissioners; and a volunteer Citizens' Planning Commission, which has recently been organized and has engaged a consulting engineer to carry on its studies. The actual official authority of the former two bodies is small, as the city commission has no other definite authority than the approval of lot subdivisions, and the county commission is purely advisory, on subjects referred to it by the county board. The citizens' body is entirely unofficial and will presumably aim to accomplish results by guiding and shaping public opinion.

Highest Chimney Built for Smelter at Anaconda, Montana

Brick Stack Is 585 Feet Above Ground and Has 60-Foot Top Inside Diameter—Concrete Base on Rock 3 to 10 Feet Below

OVERTOPPING by some feet the highest chimney hitherto built, and far exceeding in draft volume any previous stack, the new brick chimney of the Washoe Smelting Co., of Anaconda, Mont., can fairly be called the "largest chimney in the world" at the present time. The structure itself was completed last winter, and the various appurtenant works were connected up for service early this summer.

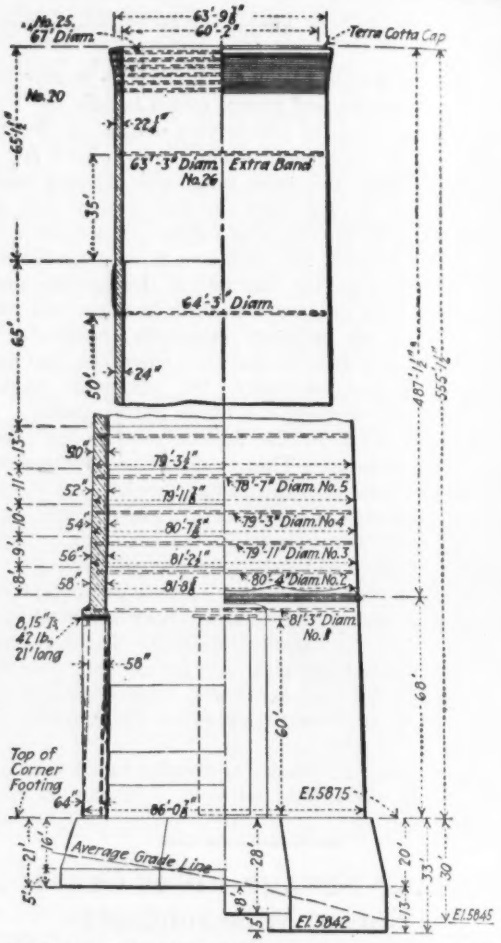
The new chimney is a part of a smoke-treating plant completed for the Washoe smelter, to reclaim gold,



NEW SMELTER CHIMNEY AT ANACONDA 585 FEET ABOVE GROUND LEVEL

silver, copper and arsenic, which were lost in the fume discharge. A Cottrell electric dust-reclamation system was installed, and this required a draft much greater than was available from the old 300-ft., 30-ft. inside top diameter brick chimney at the plant. The new stack stands about 200 ft. from the site of the old, and is connected to it by an extension of the main flue, built of structural steel frame with brick walls. Beyond the new stack is the Cottrell treating plant, which takes the deposited dust and passes it through a system of treaters and furnaces.

The stack is 555 ft. high from the top of an octagonal concrete base, itself 30 ft. above ground level at the treater-plant grade and 33 ft. above the lowest part of the stepped rock foundation on which the base rests. This makes the chimney 585 ft. 1½ in. above the main ground level, compared with 571 ft. for the next high-



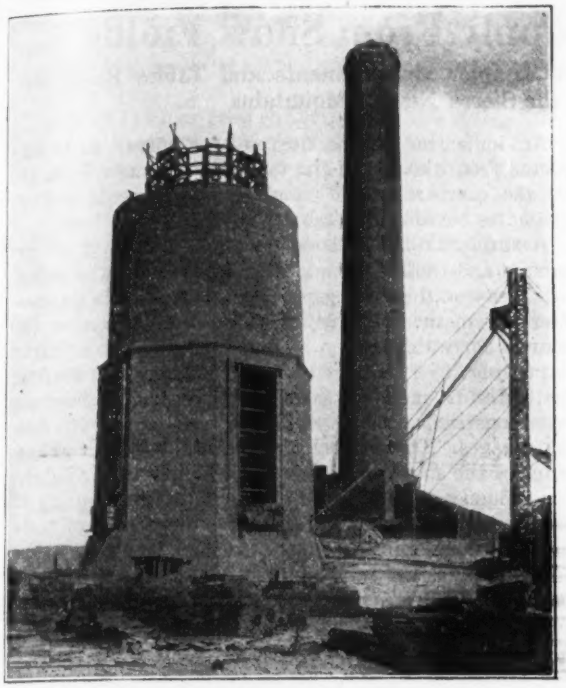
GENERAL DETAILS OF HIGH BRICK CHIMNEY FOR WASHOE SMELTERS AT ANACONDA

est stack, that built for the Tacoma Smelting Co., at Tacoma, Wash., described in *Engineering News-Record* of Apr. 4, 1918, p. 644. The Tacoma brick stack was 1 ft. higher than the concrete stack built at Saganoseki, Japan, described in *Engineering News-Record* of Apr. 12, 1917, p. 100. The comparative dimensions of the three chimneys are given in the accompanying table.

TABLE SHOWING DIMENSIONS OF THREE LARGEST CHIMNEYS

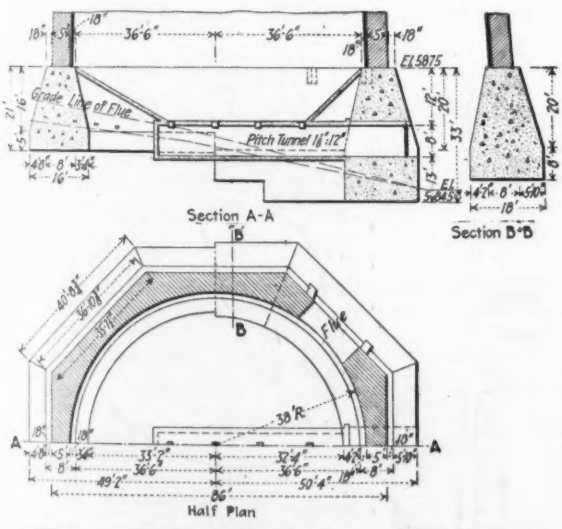
	Top Inside, Diam.	Bottom Inside, Diam.	Wall Thickness, Inches, Top	Wall Thickness, Inches, Bottom	Height Above Grade, Ft.
New brick stack, Anaconda	60 ft.	76 ft.	22½	60	585
Old brick stack, Anaconda	30 ft.	31 ft. 4 in.	12½	62	300
Tacoma brick stack	23 ft. 11 in.	39 ft.	13¼	61	571
Saganoseki concrete stack	26 ft. 3 in.	27 ft. 9 in.	7	29½	570

As shown in the drawing and in the accompanying view of the base of the Anaconda chimney, the concrete base is octagonal in shape, 89 ft. outside top diameter and from 10 to 30 ft. above the ground. On it an octagonal brick section 86 ft. in diameter and 68 ft. high carries the circular tapering brick chimney, rising as shown to a total height of 585 ft. The main shaft has five different tapers, and the thickness varies from 58 in. at the top of the octagonal section to 22½ in. at the top, under the terra-cotta cap. The concrete base reaches down to a good rock foundation, with a load of about 7.5 tons per square foot.



WASHOE STACK BASE IS OF CONCRETE

The chimney is built of the radial blocks used by the Alphons Custodis Chimney Construction Co.; they are made of fine flotation tailings mixed with sand, and burned at a temperature of about 1800° F. About 17,000 tons of these blocks, 10,350 barrels of portland cement, 1850 tons of fire clay, and 2700 cu.yd. of sand were used in the chimney proper, and about 5100



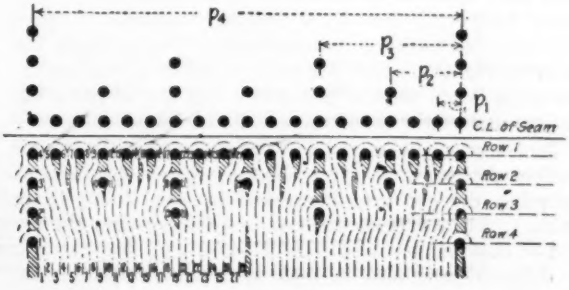
DETAILS OF FOUNDATION FOR WASHOE CHIMNEY

barrels of portland cement, 1750 cu.yd. of sand, and 4700 tons of rock in the 1:3:5 concrete used in the base.

The chimney was designed and built by the Alphons Custodis Chimney Construction Co., under the general direction of W. C. Capron, mechanical superintendent of the Washoe Smelting Company.

Design of Riveted Butt Joints After Schwedler Assumptions

AT THE spring meeting of the American Society of Mechanical Engineers, A. A. Adler, of Brooklyn, N. Y., presented a paper on the design of riveted butt joints, which after discussion of fundamental assumptions proceeded to treat analytically the Schwedler graphical method. Adopting the Schwedler conception that the plate can be considered as divided into hypothetical tension strips the resistance of each of which is equal to the strength of one rivet, simple



general equations for the analytical treatment are derived. These are here reproduced.

Considering the quadruple riveted joint shown in the diagram, in which the strips are so numbered as to show that each strip belongs to a particular rivet, the resistance of which it adds to the total resistance of the joint, if w is the width of the strip and d the diameter of a rivet, then the economical pitch for the first row is

$$p_1 = 2w + d$$

and the shaded area shown in the diagram is metal available for rivets in subsequent rows.

It is then shown that, as a general equation for the nth row,

$$p_n = \frac{p_1^n}{d^{n-1}}$$

A general equation for efficiency in tension of the nth row is derived in the following form:

$$e_n = 1 - \frac{d}{p_n}$$

As the number of rows, or n, becomes large, the efficiency approaches unity, or 100%. A slightly different form of this equation is given as follows:

$$e_n = 1 - \left(\frac{d}{p_1}\right)^n$$

The design of the cover plates, according to the author, should be made upon fundamental principles rather than from empirical rules given in certain textbooks. The principle that all strips pass through the first row is adopted, and since the pitch and tensile stress are fixed, the required area of plates is obtained by suitably determining the thickness t_c. For a joint with two cover plates, the following equation is given:

$$t_c = \frac{p_1\, t\, e}{200\,(p_1 - d)}$$

in which e is the actual efficiency of the joint in per cent. and t is the thickness of the plate.

Determination of Water-Supply From Snow Fields

Important for Irrigation and Hydraulic Works—Snow Sampler Measurements and Tables Based On Extended Investigations Made in the Sierra Nevada Mountains

SNOWFALL upon the mountain ranges adjacent to the semi-arid regions represents the greater part of the precipitation available there for irrigation and water-power purposes, so that it becomes highly important to estimate the water content of the snow upon the ground in order to determine the available supply. Extensive experimental investigations along this line have been made in the Sierra Nevada range in Nevada, while California has more recently extended similar surveys to all parts of its mountains. Two methods for determining the water content, or water equivalent of the snow when melted, consist in the use of sampling devices and of the tabulated results of investigations.

Tables of snow densities for estimating the water content for snow of given depths without the use of sampling devices are illustrated by the examples in Table I, selected from a series of tables giving the result of observations at different periods of the year and at different altitudes in both open and wooded country. These tables have been prepared by Professor J. E. Church, Jr., University of Nevada, Reno, Nev., and A. L. Smith, United States Reclamation Service, Tahoe, Calif. Professor Church is director of the university's observatory on Mount Rose and is in charge of the Nevada coöperative snow surveys (see *Engineering Record* of April 17, 1915, p. 494).

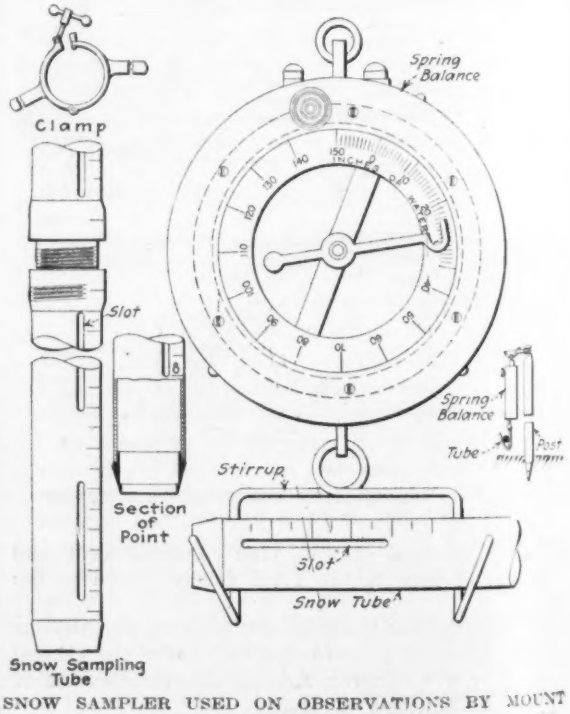
The tables are based on several thousand measurements and represent the average condition of the snow in the Sierra Nevada Mountains during seven years. While they are adapted particularly for the use of hydraulic and irrigation engineers in estimating the water content of snow, they are available also for estimating the snow loads on railway snowsheds, bridges and roofs. They are of particular interest also to the United States Forest Service. In regard to the application of these tables, sufficient measurements of the depth of the snow would be made in advance at various places in the snow field to assure determination of the average depth. Then, by consulting the nearest corresponding depth in the tables, the water content will be found in the adjoining column. This represents inches of depth, the cubic contents or acre-feet depending upon the area of the field. The column of "density" represents the ratio of water content to depth as a percentage, and is given for convenience in comparing the various depths. These tables are fairly representative of the Sierra Nevada and the mountains farther north, but it is explained that they should be used only when a snow sampler is not available.

The density and the water content of settled and compact snow rather than newly fallen snow are indicated, and the figures are to be regarded as approximate, owing to the wide seasonal variation that prevails in the density of snow. The figures apply to snow only and do not include the underlying slush or ice. Since the density of shallow snow is subject to great variation by the accretion of new snow or by melting, the top 4 in. of depth is discarded in the estimates. In making the measurements of depth, care should be taken to wait for several days after the precipitation, in order to allow the snow to settle and acquire approximately the density of the older snow cover beneath it.

An indication of the degree of accuracy to be expected from the use of the tables is shown in Table II. by the comparison of sampler measurements and of estimates based on the tables.

A survey or measurement of the snow cover on the ground and the measuring of snow as it falls by means of gages—on the same general principle as rain gages—are two methods employed for estimating snow resources for water-supply, as noted in a report on "Snow Surveying" by Professor Church. He considers the first method to be the more satisfactory by far, as there are numerous difficulties in obtaining reliable results with snow gages. These difficulties include the varying character of the snowflakes—which may be heavy or light—the influence of winds and air currents, the freezing of the contents of the gage chamber, the depths of snow and the inaccessibility of the gages. If it is possible for parties to reach the gages in March or April, which is the time when estimates should be made for the next season, it will be possible also for them to make the more accurate snow survey. (See also "Snow Surveys for Predicting Stream Flows," in *Engineering News* of May 29, 1913, p. 110.)

Stationary measuring stakes and portable samplers are the principal means employed in a snow survey. Unless the stakes are used in large numbers they are unsatisfactory, according to Professor Church, except in forested districts or in pockets on the mountains where the snow fields are protected against the erosion and shifting due to wind action. The snow sampler, however, eliminates the difficulties attending the use of gages and stakes, while it furnishes both the depth and the water content of the snow. It can be operated wher-



SNOW SAMPLER USED ON OBSERVATIONS BY MOUNT ROSE OBSERVATORY, NEVADA

ever two men on snowshoes can penetrate. Two men are necessary for safety reasons, but a third man would add to the expense of the work without any corresponding advantage.

The snow sampler used in the Nevada surveys, as described by Professor Church, and shown in the accompanying drawing, consists of a 1¾-in. tube of cold-drawn seamless steel tubing 4 to 10 ft. long, made in sections put together with screw sleeve couplings, and having the bottom fitted with a cutter 1½-in. in diameter. This tube is thrust into the snow and takes a sample or core, which is prevented from falling out when the tube is raised, by means of the interior shoulder formed by the cutter point. Vertical slots at intervals enable the core to be observed, and its height is indicated by graduations on the tube. An occasional coating of shellac protects the metal from rust and reduces clogging.

By inverting the tube the snow core is discharged readily, and any snow which adheres is removed by a cleaner in the form of a thin, curved blade which can be inserted through the slots. A two-handled wrench or circular clamp, made to embrace the tube, assists in driving and removing the sampler when working in compact snow. This tool is an aid also in uncoupling the sections. A rotary motion should not be given to the tube, except in hard snow, as such a motion tends to draw in snow through the slots. The tube is forced with a steady pressure, a plunging action being permissible only when the snow is very hard. However, a milled cutter has been perfected which permits of forcing the sampler by a slow, rotary motion through crusts of all degrees of toughness and even through 1 or 2 in. of ice, without losing the core of snow in the tube.

To determine the water content of the samples, the tube is laid horizontally in a stirrup attached to a spring balance of the Forschner type, the circular dial of which is graduated to indicate depth of water in inches. The

TABLE I. TABLE OF DEPTHS AND EQUIVALENT WATER CONTENTS OF SNOW ON MOUNTAINS IN NEVADA

	February-March: 5,000-7,000 Ft.						February-March: 7000-9000 Ft.					
	Open Country		Forested Country				Open Country		Forested Country			
	Uniform Depth		Thin Forest		Dense Forest		Uniform Depth		Thin Forest		Dense Forest	
Snow Depth Inches	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density
10	3.84	38.4	3.89	38.9	3.42	34.2	.....	.....	.....	.....	.....	.....
20	7.64	38.2	7.28	36.4	6.92	34.6	.....	.....	9.42	46.2	.....	.....
30	9.65	32.2	10.56	35.2	10.44	34.8	.....	.....	11.71	39.0	.....	.....
40	14.90	37.3	14.48	36.2	14.17	35.4	15.54	38.9	16.21	40.5	13.38	33.5
50	19.60	39.2	19.32	38.6	20.02	40.0	21.50	43.0	20.36	40.7	14.00	28.0
60	21.70	36.2	22.71	37.9	21.23	35.4	25.71	42.9	24.24	40.4	19.96	33.3
70	27.22	38.9	26.79	38.3	26.17	37.4	30.35	43.4	28.55	40.8	26.28	37.5
80	28.63	35.8	27.71	34.6	27.85	34.8	34.72	43.4	33.51	41.9	27.43	34.3
90	31.78	35.3	30.28	33.6	30.96	34.4	38.86	43.2	37.42	41.6	.....	.....
100	37.47	37.5	38.63	38.6	34.59	34.6	42.95	43.0	39.65	39.7	.....	.....
110	.....	.....	40.73	37.0	38.84	35.3	46.73	42.5	44.32	40.3	.....	.....
120	.....	.....	.....	.....	.....	.....	51.44	42.9	49.71	41.4	.....	.....
130	.....	.....	.....	.....	.....	.....	56.25	43.3	54.88	42.2	.....	.....
140	.....	.....	.....	.....	.....	.....	61.62	44.0	59.65	42.6	.....	.....
150	.....	.....	.....	.....	.....	.....	66.76	44.5	62.00	41.3	.....	.....
160	.....	.....	.....	.....	.....	.....	72.06	45.0	65.86	41.2	.....	.....

	April-May: 5000-7000 Ft.						April-May: 7000-9000 Ft.					
	Open Country		Forested Country				Open Country		Forested Country			
	Uniform Depth		Thin Forest		Dense Forest		Uniform Depth		Thin Forest		Dense Forest	
Snow Depth Inches	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density
10	3.75	37.5	4.10	41.0	4.52	45.2	3.73	37.3	4.57	45.7	4.13	41.3
20	8.84	44.2	8.18	40.9	8.29	41.5	8.16	40.8	8.21	41.1	8.58	42.9
30	13.75	45.8	12.25	40.8	10.69	35.6	12.19	40.6	11.74	39.1	12.00	40.0
40	17.93	44.8	16.08	40.2	17.06	42.7	18.38	46.0	16.50	41.3	17.50	43.8
50	.....	.....	20.37	40.7	21.32	42.6	22.11	44.2	20.60	41.2	19.92	39.8
60	.....	.....	25.65	42.8	24.61	41.0	28.83	48.1	24.99	41.7	25.37	42.3
70	.....	.....	28.75	41.1	29.26	41.8	33.77	48.2	29.59	42.3	28.93	41.3
80	.....	.....	37.26	46.6	30.04	37.6	39.52	49.4	34.89	43.6	32.93	41.2
90	.....	.....	41.09	45.7	36.06	40.01	43.08	47.9	39.99	43.8	38.04	42.3
100	.....	.....	44.05	44.1	43.78	43.8	49.45	49.5	45.16	45.2	40.80	40.8
110	.....	.....	47.34	43.0	.....	.....	56.23	51.1	52.63	47.8	45.38	41.3
120	.....	.....	56.06	46.7	.....	.....	58.51	48.8	55.49	46.2	48.41	40.3
130	.....	.....	.....	.....	.....	.....	66.32	51.0	58.89	45.3	57.72	44.4
140	.....	.....	.....	.....	.....	.....	67.26	48.0	64.66	46.2	59.65	42.6
150	.....	.....	.....	.....	.....	.....	.....	.....	66.23	44.2	65.01	43.3
160	.....	.....	.....	.....	.....	.....	.....	.....	70.84	44.3	74.97	46.9

TABLE II. COMPARISON OF WATER CONTENT DETERMINATIONS OF SNOW AS MADE FROM SAMPLER MEASUREMENTS AND TABLES

(Entire Courses Only Are Compared)

	1913-14			1914-15			Feb.-Mar., 1915-16			April-May, 1915-16		
		Water Content			Water Content			Water Content			Water Content	
Stations	Depth	Sampler Meas.	Computed from Table	Depth	Sampler Meas.	Computed from Table	Depth	Sampler Meas.	Computed from Table	Depth	Sampler Meas.	Computed from Table
Summit	.....	.....	.....	86.4	40.04	35.92	173.5	64.20	56.36	99.7	45.40	45.03
Ward Creek	100.3	53.02	49.60	94.1	43.17	45.04	139.8	67.52	61.66	111.4	58.90	56.94
Tahoe City	66.1	24.00	25.70	40.4	14.99	15.05	61.5	25.62	21.76	38.1	18.40	16.25
Sunnyside	.....	.....	.....	46.2	18.26	17.85	69.5	27.03	26.60	.....	.....	.....
Blackwood	58.9	26.17	24.16	71.2	25.67	29.76	91.0	32.41	31.29	.....	.....	.....
Rubicon	143.9	63.07	63.89	95.4	35.72	38.92	55.3	22.14	20.93	.....	.....	.....
Mt. Tallac	107.3	52.67	51.34	64.1	31.54	26.70A	.....	.....	.....	.....	.....	.....
Mt. Tallac (9750 ft.)	146.5	68.83	69.67	70.0	31.36	28.29	.....	.....	.....	.....	.....	.....
Mt. Tallac (8000 ft.)	134.2	65.92	68.46	73.7	35.54	31.16	.....	.....	.....	.....	.....	.....
Lake Lucille	.....	.....	.....	88.8	37.67	36.92	.....	.....	.....	157.7	76.02	73.89
Glen Alpine	56.6	26.58	25.39	39.5	15.83	17.22	.....	.....	.....	101.8	45.84	44.84
Bijou	.....	.....	.....	27.8	12.01	8.94	41.9	16.01	15.17	.....	.....	.....
Zephyr Cove	.....	.....	.....	25.1	9.11	8.07	41.8	15.96	15.57	.....	.....	.....
Marlette Lake	.....	.....	.....	49.4	20.03	21.24	87.5	32.44	30.90	.....	.....	.....
Glenbrook	.....	.....	.....	18.1	6.33	6.75	.....	.....	.....	.....	.....	.....
Mt. Rose (9000-10,800)	99.9	48.12	48.65	58.0	24.56	26.91B	83.9	40.49	36.26*	.....	.....	.....
Mt. Rose (9000-10,500)	70.5	32.55	32.40	51.6	20.98	22.62B	45.9	20.80	18.42*	.....	.....	.....
Mt. Rose (9000 ft.)	90.8	46.40	42.35	56.5	25.06	26.15	102.9	49.56	46.58*	.....	.....	.....

A. Water running from the snow. B. Cornice, talus and timber.

* Measurements made Mar. 28. Consequently the average of the two tables for February-March and April-May was used.

pointer has an L-shaped head with graduations, so that fractional parts can be read with greater accuracy than by the ordinary arrow head. It has been objected that the core will be too small to permit of correct determination of its water content, but Mr. Church states that tests have shown it to be accurate within 1.1 per cent.

Tabular samplers of other designs, generally of larger diameter, have been used here and abroad, but the efficiency of the sampler described is indicated by the fact that it has been adopted by the Swiss Glacier Commission engaged in making studies of the glacial snows of the Alps. As the entire equipment, with a spring balance, tools and 21 ft. of sampler tube, weighs only 25 lb., it can be carried by two men even in rough country, while it has been carried by one man.

The range and the accuracy of the snow sampler are limited only by the spring balance, the accuracy decreasing proportionately as the range is increased. With a light sampler measuring only shallow snow, the balance might have a small range and be capable of recording water contents to 0.01 in. But for work in snow of 10- to 20-ft. depth the range must be 120 in. of water, which precludes measurements closer than 0.1 in. Professor Church suggests that this difficulty would be obviated by the use of a lever balance, if this could be made sufficiently light and compact. On the other hand, close refinement is necessary only for intensive study. In surveys over irregular ground, and where there is considerable variation in the depth of the snow, greater accuracy is obtained by a large number of measurements than by a small number of exact measurements.

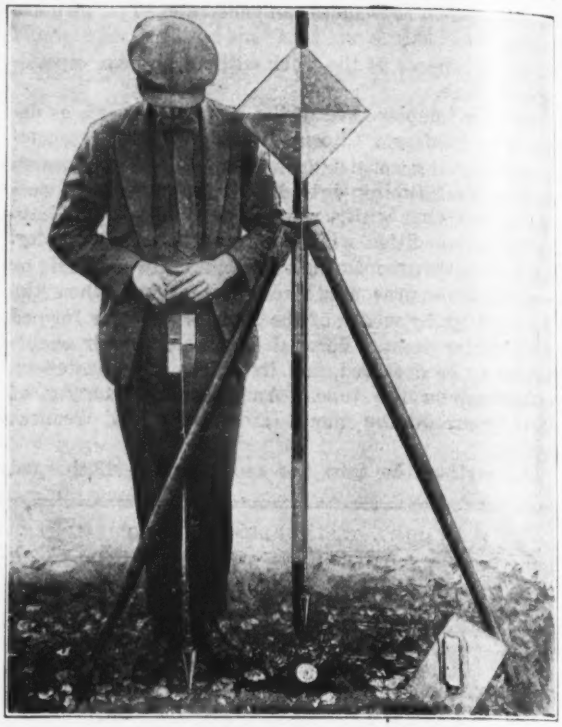
Special Targets Facilitate Survey of Flood Works

By R. C. Chaney
Construction Engineer, River Channel Improvements, Columbus, Ohio

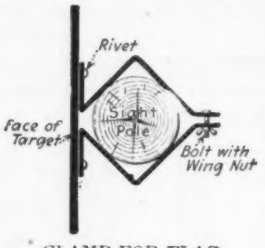
TWO special targets which proved especially convenient in making the surveys for the flood improvement work at Columbus, Ohio, were made of sheet metal on the job. The larger target, 10 in. square, was used on a sight pole held in a tripod, and the small one, a 3 x 8-in. hand target, was mounted on a marking pin. Both were painted on No. 12-gage galvanized iron, and had soldered at the intersection a wire loop from which to suspend a plumb bob for centering over the point.

The rod target was used principally on the triangulation work, and was very valuable, as it gave a fixed sight, accurately plumbed over the station at a height variable up to 9.5 feet when used with a 10-foot flag.

This was of great assistance in cases of obstacles such as low foliage, weeds, fences and levees. A rodman easily made the set-up, after a little experience, in one minute. The point of the flag was stuck into the ground about half a foot back of the station to allow the plumb line to clear the tripod head, and by the moving of the point to one side or the other the plumb bob was centered. When set, the instrument man was signalled, and the rodman, finding a shady seat, waited for his release to set up at the next station, or to orient the target to face the next transit set-up. Care was necessary to "line up," or to place the vertical line of the target in the plane of the transit and plumb line. The target was attached to the flag by a clamp with wing nuts, riveted to the back of the target, as indicated by the drawing.



FLAG ROD AND MARKING PIN TARGETS



CLAMP FOR FLAG ROD TARGET

The hand target could be used with or without a plumb bob. The point of the pin was lined with the vertical line of the target and could be held on a tack or stuck into the ground for holding line or grade tilt.

Brick Water Conduit Gives Long Service

A brick conduit built in 1852 to convey water from Rensselaer Lake to the City of Albany, N. Y., is reported by Wallace Greenalch, commissioner of public works, to be giving good service after more than 65 years of use. It is built of brick, 8-in. shell, 3 x 4 ft. in size, egg-shaped, with the small end up, has a fall of 1 ft. per mile and is four miles long. William J. McAlpine was engineer for the new water-supply of Albany, introduced after the city bought out the Albany Water-Works Co. According to "The Manual of American Water-Works" for 1888: "The conduit was built in an embankment having foundations 42 ft. wide, slopes of 2½ to 1, top of bank 6 ft. wide and 9 ft. above grade line. After being in use a short time the conduit settled throughout its length, and cracks from 50 to 200 ft. long admitted quicksand and water, washing out the mortar in the arch. At other places large holes in the bottom allowed heavy leakage. The conduit was repaired and continued in use."

Impressions Here and There

Pittsburgh is an attractive stopping point for the seeker after news of municipal construction. It is a city whose public works are gradually transforming it from an area of steep and bare hillsides six hundred feet high into a habitable community with all modern conveniences. This is a carving-out process that is bound to go on rather slowly; even today the business district is connected with the east side residential zone by a scant half-dozen thoroughfares, and one of these was opened only a few years ago. Since there is so much to be done, however, Pittsburgh has always been unusually active in public-works construction: street improvements, bridges, extensive regradings, drainage and sewerage works.

Just now, however, any curiosity to learn what new things are going on in Pittsburgh is quickly satisfied. Walking up Grant St. you see no "hump cutting" operations such as were going on some years ago. There is no bridge construction in progress, in this city of hundreds of bridges. Little building work is seen. It almost looks as though things were waiting for clearer weather, financially and industrially. Fully three months ago the voters of the city passed a big bond issue, something like $20,000,000, for various public improvements, and it was the general expectation that the authorities would start work at once, so as to make use of the 1919 season. Yet there is nothing doing. A few small items are started, mainly little pieces of street work, but they do not show on the surface.

Status of Large Projects

Besides the city bond-issue work, there is the South Side tunnel and bridge project, undertaken by the county. Months ago it was announced that contracts for the tunnel would be let by October and work ought to be under way by now; but it seems that even plans for the tunnel have not yet been completed and approved, let alone designs for the bridge across the Monongahela that is needed if the tunnel is to be of any particular use, a bridge that is a very large undertaking in itself.

By far the largest item in the city's bond issue, the street-car loop subway, has been marking time ever since the vote was passed. Chief Engineer Sprague of the Public Works Department states that there is no use making plans or otherwise spending money on this project until a contract for operation can be made; that is, until the street railway company is out of its receivership. What if the receivership should be long continued?

There is, by the way, a most interesting situation surrounding the street-car loop subway matter. This subway scheme, it should be remembered, follows upon eight or ten years of scheming for rapid transit. The last preceding step in this planning was taken two years ago, when E. K. Morse, as city transit commissioner, worked out a plan for two combined subway and elevated lines running from the south side and north side respectively up to the east end. Now, however, comes Mr. Sprague and says that the city does not yet need rapid transit. Instead, he says, it is in very urgent need of better street-traffic facilities in the downtown district. And on the basis of this new view of the situation he has worked out the street-car loop subway.

Downtown Pittsburgh is small in area and has narrow streets, which in the rush hours are full to overflowing. Most of the street-car lines enter this small district, occupy the best part of the streets, and by their slow traffic movement while crowds are entering and leaving they largely create the condition of congestion. The situation is unique. Pittsburghers claim that no other city in the country has so acute a street-traffic problem, and observation tends to show that they are not far wrong. Something needs to be done if the necessary flow of downtown business is not to be hampered. Mr. Sprague's solution is the loop subway, and ejecting the cars from the streets.

But even this is not expected to be more than a temporary relief. Some years ago, in connection with the last hump cutting, the city widened several of the downtown streets. Still the streets of the district are much too narrow, and there is hardly a chance for more street widening on account of the tremendous costs involved, so that the business district will have to get along with the streets it now has. Expansion of the business district uphill, east from Grant St., is inevitable, yet it seems certain that for many years to come most of the business will be done on the flat, west of Smithfield St. When the increased street capacity obtained by removing the street cars has been used up there will still be more traffic than the streets can take care of in the long run, it is claimed. The final step, then, may be the removal of sidewalks and the construction of underground or overhead arcades for pedestrian traffic. This is a long look ahead, but they have taken that look in Pittsburgh.

Architects in Role of Bridge Engineers

There is some designing activity in connection with the necessary rebuilding of three of the county's bridges over the Allegheny River. This matter, however, is in a very peculiar condition, as at least two of the bridges have been turned over to architects to design and build. Just what an architect knows about bridges -- especially steel arch structures 400 or 500 ft. in span -- is not apparent, and from expressions of opinion of one or two engineers there would appear to be liklihood that the whole matter may develop into a little scandal, locally. The bridges involved are in every sense city bridges, serving city traffic, but the city owns them, having bought them from private owners some years ago, and therefore, being under orders of the War Department to provide more adequate navigation clearance, is proceeding to replace them by new bridges. The city authorities are interested not only in desiring to have the work handled with safety and with due observance of engineering principles and precautions, but also in that they must build

the approaches. It is generally agreed that the structures are of such magnitude as to constitute problems of the first importance, and that a high grade of engineering ability should be enlisted in their planning. There should be interesting news in this situation for the Engineering News-Record sooner or later.

While the two matters I have mentioned are the most interesting items of engineering thought just at present in Pittsburgh's municipal work, the fact remains that this community, whose construction work ought to be specially active just now, has practically nothing going on. The general psychology of uncertainty prevailing this season may be partly responsible, but in each individual case at least some of the delay is due to the time needed for getting out plans. Perhaps some of the blame ought therefore to be placed on lack of preparatory engineering work last year, the same thing that seems to be back of much municipal and industrial delay throughout the country. During the war Engineering News-Record repeatedly urged the duty of carrying on engineering preparatory work so that normal activity could be resumed after the close of the war without a dangerous idle interval. This advice seems to have been little heeded.

Oct. 15, 1919 Pittsburgh

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

HINTS ON APPLYING FOR A JOB BY LETTER

Sir-- Having had occasion during the past year to read a large number of applications for positions from engineers and would-be engineers, the writer has realized as never before the importance of care in the writing of an application.

Trained engineers should be better able to present their qualifications accurately and concisely than almost any other sort of applicant for a position, since their training is supposed to inculcate accuracy and conciseness. However, a scrutiny of a great number of applications, particularly those received since the war, reveals a great lack of these qualities. This may be partially accounted for by the fact that the war has produced a large number of "engineers" who did not know a transit from a level two years ago. These men naturally cannot make as good a showing with a tabulation of their experience as men of long service. But even among men who claim to have ten years' experience in engineering many omit to give a single detail as to where they have worked or from which school they were graduated.

A great many such statements as given below occur: "Graduate of a leading technical school"; "college graduate"; "three years in engineering course at college and five years' practical experience"; "two years as instrumentman and 15 months as head of party on railroad surveys"; "will send references if you wish them"; and many others just as uninforming.

If a man would think a minute he would realize that an employer would want to know the name of the school at which the applicant studied and that he would judge whether it was a leading college, etc. The employer should be able to form a mental picture of the applicant from reading his application, and the picture should be so nearly accurate that he will not receive a shock when the applicant appears in person later. In fact, it is well worth the trouble to send a recent photograph bearing a statement of the date on which taken.

Two items of the applicants' qualifications that are usually of considerable importance seem to be given more often since our war experience-- these are age and health. The information married or single is occasionally lacking.

There is also great variety in the manner of expressing confidence in one's ability to fill the position satisfactorily. It is not amiss to say something like, "I should do my utmost to give satisfactory service"; or "with my training and experience, I feel that I can satisfactorily handle the work involved in the position for which I am applying". But to say "I am sure that I am the very man for which you are looking" does not very deeply impress the employer.

It has been observed also that some of the men applying for position as draftsman wrote so poor a hand as to be almost illegible. Of course some allowance might be made for the old belief that lettering spoiled one's handwriting. But the more certain fact that poor lettering spoils an otherwise good drawing should not be overlooked.

Probably the most satisfactory application states, after an introductory sentence, the training and experience which fit the applicant for the position sought. Dates of employment and names of employers should be given, even though the period of employment has been brief. Age, height, weight, married or single, and condition of health should be given. Whether these are listed before or after statement of training and experience is a matter of choice, unless these items have received special stress in the advertisement for applicants, in which case they should, of course, come first.

It is remarkable how one's characteristics will show through even a brief letter of application. This is not so evident in applications filled out on printed forms. For this reason one should accompany such an application with a brief note emphasizing any valuable experience that has particularly fitted him for the position sought. A certain amount of self-confidence is a very valuable asset, but it should not be too evident in an application. Not many employers will admit, even to themselves, that they are seeking someone to come and show them how to run the business.

COLUMBIA, S.C. R. T. BROWN,
State Highway Department of South Carolina.

NATIONAL DEPARTMENT OF PUBLIC WORK VERSUS CORPS OF ENGINEERS

Sir-- You published in your issue of Sept. 18, on pp. 561-2, a communication from me under the caption, "National Department of Public Works vs. Corps of Engineers."

I have become aware of an error in that paper which I greatly regret. I gave the length of the continental and insular coast line of the United States and its dependencies as 48,881 miles, whereas the actual coast line, as given in the best authorities to which I have had access, is only 24,599 miles. I used the erroneous figures in a discussion of this subject six years ago, and I cannot now trace the error to its origin. The article under discussion has brought me very gratifying letters of commendation. It is also gratifying to learn through the statement made by ex-Col.Roger Black,Corps of Engineers, U.S.A., made on Sept. 17, at a meeting of the American Society of Civil Engineers, that the General Staff of the Army holds the view that the Corps of Engineers would be benefited if it were relieved of river and harbor work and so enabled to devote its whole time and thought to strictly military engineering.

I note that Colonel Black dissents from this view, as is natural, for, although he is no longer an integral part of the corps,he is loyal to its traditions and jealous of its prestige.

CHICAGO,ILL. ISHAM RANDOLPH
Consulting Engineer.

DOES RICH CONCRETE IN ROADS CRACK MORE THAN LEAN?

Sir-- The question and the answers on the above subject which appeared in "Engineering News-Record", Sept.11,1919, p.518, were published at a time when I was having several sleepless nights trying to determine the cause of the small cracks which were appearing in the two-course concrete pavement being laid in this city.

It is almost impossible to find in this part of the country good concrete aggregates suitable for pavement construction. However, the people of this city chose a two-course concrete using a 5-in. base of a 1:5 mix of a local pit-run gravel. The wearing surface is 2 in. of a 1:2:3 mixture of good, clean sand and traprock from Duluth, Minn.

The pit-run gravel contains a small amount of clay or silt which will pass a 400 sieve. The gravel is also unfit for use, as is shown by results obtained from the application of the colorimetric test. However, upon the strength of the fact that this material had been used as a base for a large amount of sheet asphalt, word was given the contractor that the material could be used.

The first use of the material since my coming to Bismarck was on concrete curb. The mix used was 1:4, laid in sections 10 ft. long. I noticed cracks developing in almost every section of this curb, some of them appearing even before the forms were removed, which was usually about three hours after filling.

I was positive the cracks were not due to a poor foundation nor to the concrete drying too rapidly. I decided they were due to an excess of fine material which actually increased in volume when wet and decreased rapidly upon drying. The following day I increased the proportion of gravel, using a 1:5 mixture. Only one crack developed on that day's run.

Since starting the actual laying of the paving, I have noticed a number of these shrinkage cracks appear in the wearing surface. At first I was at a loss to know why they should appear there, but have finally decided that they were caused by intermixing the two courses during a process of placing; and I have overcome this to a large extent by making the contractor mix the base course very dry and tamp it to place.

In conclusion I will say that I do not believe rich concrete will crack more than lean, providing the aggregates used are clean and coarse.

BISMARCK, N.D. B. H. TONG
Chief Inspector, Concrete Paving.

SATISFACTORY EXPERIENCE WITH BOLTED FIELD-CONNECTIONS

Sir-- In regard to the subject of bolted versus riveted field connection,dealt with in "Engineering News-Record" of Aug. 14,1919, p. 316, we wish to say that we have one important structure on the Chicago & Eastern Illinois R. R. which has bolted connections. This is the steel viaduct over the Kaskaskia River, just south of Shelbyville, Ill. The viaduct is 1400 ft. long and 85 ft.high. All of the tower bracing and the bracing in the 125-ft. truss span has bolted connections. The bolts are all turned bolts. This structure was built in 1896 and, so far as I know, there has never been a loose bolt found.

CHICAGO, ILL J. E. BERNHARDT
Bridge Engineer
Chicago & Eastern Illinois Railroad

Sir-- In regard to R. Fleming's article on "Bolted Field Connections," in your issue of Aug. 14, 1919, p. 316, the writer, looking at the question from the viewpoint of an erector, believes with Mr. Fleming that the advantages of bolted field connections over riveted connections in certain classes of work far outweigh any possible disadvantages.

While riveted field connections are the standard form of construction and always will be, so long as good rivets can be driven in the field, structures are often designed in which it is very difficult to drive good field rivets. I believe that a good bolt is superior to a poor rivet, and for all practical purposes is equal to the average field rivet. Unless all conditions are extremely favorable, it is hard to get a point of, say, 40 rivets tight; and every rivet cut out loosens one or more "tight" rivets, so that it is an endless job to get a tight point. The practice of riveting structural and cast steel together is decidedly wrong, and in such work a tight rivet is an accident.

There is no doubt in my mind that a field connection properly made up of turned bolts in reamed holes of the proper size is just as good as,if not better than, a riveted connection. A bolt can be drawn tighter with a wrench than a rivet can be drawn with a hammer, and the danger of stripping the threads can be controlled by limiting the length of the wrench handle. One of the best arguments in favor of bolts is that very frequently too much paint is applied to the surface of the steel before rivets are driven. The hot rivet burns the paint, and the result is very noticeable when connections are cut apart after several years. The burnt paint forms a powder which retains

moisture and causes corrosion of the rivet and plates at their points of contact. A painted connection fitted up with turned bolts, when cut apart, shows in good condition; even the color of the paint is very noticeable.

When long rivets are used in important work, the rivets should be "swell necked" or tapered in a reamed hole, as a long rivet will not upset in the hole from the side where it is held as it will from the driven end. The usual clearance in punched work is 1/16 in., and therefore the rivet, to fill the hole, would have to increase 1/16 in. in diameter throughout its length. If it did not do this it would not, theoretically, be a good rivet. As a matter of fact, a great many rivets which show no jar when tapped (because the rivet has shrunk tight) can be moved from 1/32 in. to 1/16 in. by a few blows from a 3-lb. hammer.

Field painted connections, improper heating, burnt rivets, poor air pressure and wornout tools are the principal causes of poor field rivets, while none of these enter into the quality of a field-bolted connection. Taking into consideration the extra costs of bolts and all other features, the cost is less on bolted work. If bolts are properly checked there is no more reason to inspect them after the initial inspection than there is to inspect rivets. I believe that a turned bolt in a reamed hole is superior to a field rivet, and that a field rivet in a punched hole is superior to a machine bolt in a punched hole.

In ordinary light mill buildings, for all practical purposes field bolts, while by no means the equal of field rivets in that they do not fill the hole completely, should be used more extensively than they are. It is much easier to get a good short rivet than a good long one; I would rather see turned bolts than rivets in long holes, and rivets rather than bolts in short holes. For mill-building work in general, particularly in concrete-incased work, I believe that ordinary machine bolts should be used more extensively. For bridge work and skyscrapers, however, I am of the opinion that turned bolts or rivets should be used. It is a waste of time and money to rivet purlins in roofs, small connecting beams in floor systems of buildings, and the intersections of cross-bracing or other isolated points having one or two rivets.

CHICAGO, ILL. W. L. KELLY,
President,
Kelly-Atkinson Construction Company.

AREA EFFECTS IN SOIL-BEARING TESTS

Sir-- The article entitled "Test of Sandy Foundations at Arch Bridge Pier," in your issue of July 31, 1919, p. 208, is very interesting and the writer feels that the desirability of making such tests should be more widely recognized by engineers at large. It is only in this practical way that the profession can hope to add to its fund of knowledge concerning the bearing value of soils. Chemical and laboratory tests throw little light on the subject, geological considerations are valuable on very large and a few special foundation designs, and theory is good to interpret and codify results; but actual test under working conditions is "the thing."

The settlement of a foundation under load is the result of three principal soil movements: (1) Vertical compression of the soil under the footing; (2) horizontal compression of the soil outwardly from the center of the footing, and (3) movement of the soil in mass outwardly from under the footing by lifting the soil around the outside of the footing.

Small footings and tests are likely to show lower unit values than would be shown by footings with larger areas, since the soil has a better chance to move out from under them by the lifting of the surrounding soil. In the test described in the above-mentioned article, however, the reverse is the case; the small test area was taken near the center of the already constructed pier footing so that there was practically no chance of lifting action of the soil around the outside of the test area. It is reasonable to believe, therefore, that the average bearing value of the soil under the pier as a whole will be somewhat less than that shown by this test

NEWPORT NEWS, VA. HUNLEY ABBOTT.

TRAVERSING BY THIRTY-FIVE MINUTE ANGLE METHOD

Sir-- Referring to an article entitled "Traversing by a Thirty-Five Minute Angle Method," by John H. Sawkins, in your issue of Aug. 21, 1919, p. 373: Mr. Sawkins has presented a novel and useful method of measuring traverse lines or similar distances approximately. However, if a great deal of this work is to be done, considerable time may be saved and a greater accuracy obtained by the use of vertical stadia-hairs.

The procedure is the same except that the spacing of the hairs in the telescope directly lays off the required 35' angle. Thus the time and error of setting the angle are eliminated. The transitman sets one stadia hair on the front flagpole, then lines in the front flagman in line with the second stadia hair, the flagman keeping the crossline as nearly as possible perpendicular to the line being measured. The cross distance is then measured, and its length multiplied by the stadia ratio (should be 1:100 for convenience) gives the length of the line in question.

Men on geological surveys have used their wye-levels for this work, the telescope being turned in the wyes to bring the horizontal stadia hairs into a vertical position. The only limit on the distance that can be measured is the limit on the distance that a flagpole can be set. The method has proved successful on distances up to 8000 feet.

CHAMPAIGN, ILL. C. B. SCHMELTZER.

PAYING FOR WATER-MAIN EXTENSIONS AT BRISTOL, CONN.

The cost of water-main extensions at Bristol, Conn., in excess of what is estimated to yield a revenue of 10%, will be assessed on abutting property owners hereafter, in accordance with a recently adopted amendment to the city charter. When a property owner who has not been taking water, and who has paid an assessment, connects with the water main the assessment will be refunded "or as much thereof as the assured income shall be 10% of." Assessments for mains, the cost of replacing services or laying new services, and all charges for water, are made a lien on the real estate supplied with water. Charles L. Wooding is chairman of the Bristol Water Board.

HINTS FOR THE CONTRACTOR

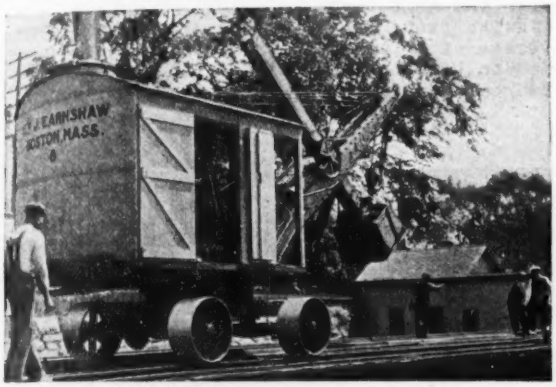
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

TRACTION STEAM SHOVEL TAKES RAILROAD BRIDGE FOR SHORT CUT

BY H.P.J.EARNSHAW

Boston, Mass.

Due to a big bend in the Merrimac River at Nashua, N. H., a roundabout journey of a mile through the city streets was required to transport plant from the railroad yard where it was unloaded to the Jackson Mill job. However, a railroad bridge provided a direct



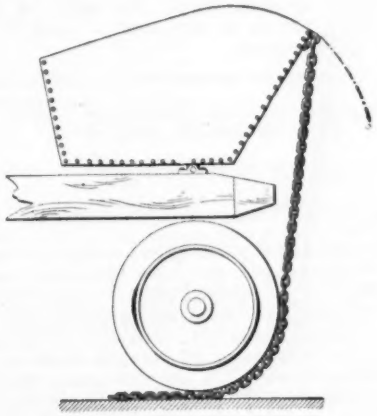
Shovel Crosses 200-Foot Bridge in 15 Minutes

shortcut from the yard to the job. In spite of the 40-ft. drop from the top of the rail to the bend of the river, we took a chance on derailment and wreckage, and crossed the bridge, running with our broad-tired wheels on the top of the two inside rails of the double track. The shovel was held rigidly in line on the rails and crossed the 200-ft. bridge in 15 minutes.

CHAIN TILTS AND DUMPS TRUCK BODY

Motor trucks with gravity dump bodies employed in hauling wet concrete for road construction on a contract in Illinois are successfully dumped with little loss of time by means of a 10-or 12-ft. chain with a hook at one end. These bodies carry 2 cu. yd. of wet concrete and are designed to dump by gravity when the holding-down tie is cast loose. With a load of wet concrete the center of gravity of the mass is not that computed for loose materials, and the point of rotation is wrongly placed for the body to dump without aid.

To overcome the difficulty, as the truck backs up to dumping position the chain is hooked over the edge of the body, as shown in the illustration, and the free end is thrown under the truck wheel. As the vehicle moves backward the chain winds under the tire and pulls down on the body until it tips to dumping position. The operation is performed so quickly that practically no time is lost in backing up to dump the load. This device was



Wheel Winds Up Dumping Chain.

worked out by The Embankment Co., Joliet, Ill., contractor, on road construction near Grant Park, Ill.

GAGE GLASS ON BARREL MEASURES WATER FOR CONCRETE

A barrel fitted with a gage glass, and having a dozen gimlet holes into which to insert a marking nail, provides a water-measuring outfit for a concrete mixer. The device has been found both accurate and flexible in use on the concrete-road construction of the Embankment Co., near Grant Park, Ill. In operation, the barrel is filled until the water in the gage shows opposite the marking nail. The barrel is filled and emptied for

Barrel With Gage Glass Measures Water for Concrete

each batch. The concrete is being mixed for road work according to the Illinois Division of Highways' specifications, which require such variation of the water content as is needed to keep the consistency constant. The barrel and gage-glass outfit has met the conditions satisfactorily. If the mixture runs a trifle stiff or too thin, the nail is shifted one or more holes up or down, until the adjustment is correct.

MATERIAL UNDER PIERS REMOVED BY JETTING WITH HYDRAULIC DREDGE

By R.W.Beuttenmuller

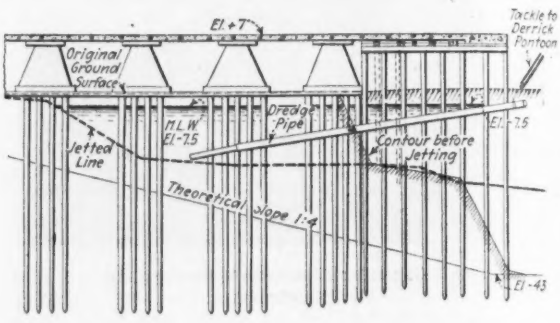
Great Lakes Dredge & Dock Company

On the Philadelphia Quartermaster Terminal, a war construction job, the progress mapped out required the dredging, piledriving and construction of the piers to be carried on simultaneously. This resulted in a condition that prevented the dredging of slopes under the piers in the slips. Due to the fact that the piers were designed to carry warehouses, the number of piles was large and required close spacing, thus preventing the material from caving and forming a natural slope. It was necessary, therefore, to remove the material from under the piers to a slope approximately the natural slope of the material, so as to relieve the pressure on the piles.

Various methods were tried to remove this material, without success. The writer then suggested that a hydraulic dredge be used to jet the material from under the piers. The dredge was placed in the center of the slip parallel to the length of the piers, with one pontoon and elbow astern and two pontoons across the slip connected to the elbow, the last pontoon being a derrick pontoon made up of two separate pontoons, so arranged as to permit the pontoon pipe to be raised and lowered, the pivot being at the first sleeve from the elbow. On the end of the derrick- pontoon pipe were connected two shore pipes with a reducer, reducing from 15 to 10 in. A tackle block was connected from the derrick pontoon to the pier. This outfit is illustrated in the photograph.

The method of procedure was as follows: The pipe was lowered at the edge of the pier to the depth previously dredged in the slip, and the dredge pump was started up. The action of the water caved the material ahead of it for a distance of 20 ft. in fairly soft material consisting of sand and mud, with a little gravel. After the required depth was obtained at this point, the pipe was raised sufficiently to clear it from the ground. The dredging pump was stopped, and by means of the tackle connected to shore the pontoon was pulled in towards the pier until the end of the pipe struck the bank, then the previous operation was repeated, until the natural slope was approximated. The tackle was then slacked off, and, due to the velocity of the water and the elbow, the whole pontoon line backed itself out slowly, at the same time cleaning the bottom of any material that might have caved in back of the pipe. Then, by means of quarter lines, the derrick pontoon was pulled ahead along the slip, and the operation was repeated between the next bents.

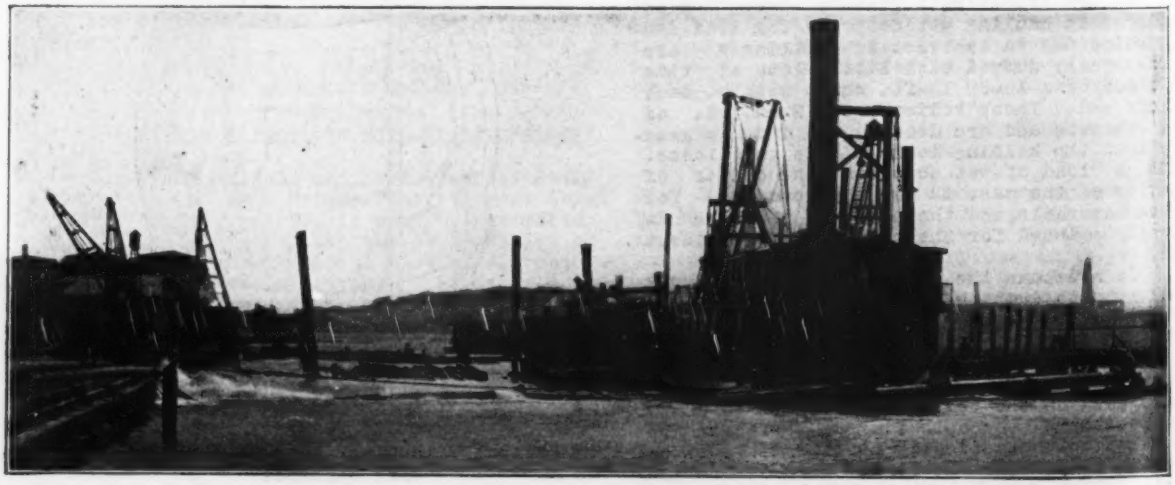
The bents on the piers were spaced on an average of 6 ft. apart, and jetting was carried on between each pair of bents. The dredge advanced itself in the ordinary way, by



Typical Section, Showing Result of Jetting

means of spuds and swinging wires. The swivel elbow permitted the jetting of a distance of 60 to 70 ft. along the length of the pier before it was necessary to move the dredge.

A typical cross-section of the result of jetting is shown. In the photograph the pipe has been raised to the level of the water in order to have it appear in the picture.



Arrangement of Dredge, Pontoons and Pipe with Relation to Pier

NEWS OF THE WEEK

New York, October 23, 1919

This Week's News

This issue carries news current for the week ending Nov. 26. It is dated Oct 23 to preserve the sequence of numbers in the volume.

PAVEMENTS AND SANITATION MAIN TOPICS OF CONVENTION

American Society of Municipal Improvements in Meeting at New Orleans Shows Growth in Membership-- Extensive Technical Program

Registrations at the twenty-fifth annual meeting of the American Socioty of Municipal Improvements at New Orleans, Nov. 11-14, numbered 280. A large percentage of these, both among the municipal engineers and the liberal representation sent by the supply men, were members of the American Society of Civil Engineers. As usual, paving and road topics dominated the program.

The total membership on Nov. 14 was 570. The cash balance on Oct. 1 was $268, in addition to $1500 of Liberty bonds. Officers for 1919-20, as recommended by the nominating committee, were elected as follows: President, George H. Norton, Buffalo; vice presidents, R. Keith Compton, Baltimore; E.S.Rankin, Newark, N. J.; W. W. Horner, St. Louis. Charles C. Brown, Valparaiso, Ind., was re-elected secretary, and Fred. J. Cellarius, Dayton, Ohio, treasurer. The next meeting will be held at St. Louis, about the first week in October.

A resolution was adopted endorsing a national highway system but avoiding endorsement of any of the bills to that end now before Congress. No action was taken on the proposed Federal Department of Public Works, although a paper outlining and advocating the plan proposed by the Engineers', Architects' and Constructors' Conference on National Public Works was read by Prof. W. B. Gregory, Tulane University, New Orleans.

A plea for a consideration of the human as well as the technical relations of the engineer was a feature of the presidential address of E. R. Conant, Brunswick, Ga., who added that the importance of an engineering society's dealing with other than technical matters is shown by the rapid growth of the American Association of Engineers.

Townsend Bill Discussed

In connection with an outline of the Townsend bill for a national highway system and a Federal highway commission, S. M. Williams, Washington, D. C., said that amendments to the bill have been proposed increasing the membership of the commission from 3 to 5, to meet a widespread demand. Another suggested amendment provides for two to four roads across each State in place of improving 4% of the road mileage, since the latter plan would give some eastern states many cross-state roads and hardly provide two such for some western states.

How far short the present Federal aid plan comes of meeting the needs of the country, Mr. Williams said, is shown by the fact that of the large total sum of money made available only a small percentage has been expended, owing to delays of the states in matching the Federal allotments. Another argument for a national system of highways urged by Mr. Williams was the fact that because of niggardly salaries paid to engineers in state highway departments the position generally is regarded only as a stepping stone. An engineer for 2000 miles of railways, Mr. Williams said, is paid five times as much salary as a state highway engineer.

(Concluded on page 778)

ENGINEERS DISCUSS RAILROAD NATIONALIZATION

Strong Sentiment Against Government Ownership and Operation

Strong sentiment against government ownership and operation of railroads was expressed at the meeting of the American Society of Civil Engineers in New York City, Nov. 19, when a paper by Col. W. J. Wilgus, proposing a plan for private operation under government ownership, was followed with discussion by Ivy L. Lee, formerly executive assistant to the president of the Pennsylvania R. R., representing the Association of Railway Executives, Col. F. A. Molitor, B. H. Bryant, Charles Hansel, and W. G. Besler, president, Central Railroad of New Jersey. The plan proposed by Colonel Wilgus was that outlined in an article by him in "Engineering News-Record" Sept. 11, 1919, p. 496, providing for government ownership but for operation under a system of competitive leasing to private companies. Exception was taken to the plan by all of the other speakers on the program. Colonel Molitor's statement that he considered government ownership now a dead issue was received with applause but none of the speakers who followed believed that the subject could so readily be discussed.

Colonel Wilgus emphasized the need for a clearer understanding of the term "Nationalization," as drawing a sharp distinction between ownership and operation. While private ownership and government operation have proved a failure, it would be preferable, he believes, to have government ownership with private operation rather than a "camouflaged" private ownership with government guarantees necessary to protect the owners of railroad securities. The system would be much less complicated, as the owners of securities would receive dividends from the Government, in the form of interest on government bonds, and the properties would be leased to private operating companies.

Mr. Lee said that he would find no objection to Colonel Wilgus' plan were it not for the fact that the railroad system of the country is as yet unbuilt, since no means are provided in the plan to attract the necessary capital for intensified railroad development. He pointed out that there is 260,000 miles of main track in the country, only 29,000 miles of double track, 2700 miles of three track, and 2100 miles of other track--- at an average cost of $78,000 per mile. In contrast the average cost per mile of track in Belgium is $216,000, and in England $275,000, showing the possibilities and the need for intensified railroad development in this country. Under the plan proposed by Colonel Wilgus it would be difficult to place responsibility for the authorization of betterments and additions.

Public's Confidence Needed

The upbuilding of public confidence in the private railroad managements was cited by Mr. Lee as the crux of the entire problem. He pointed out the dangers of the propaganda being spread broadcast by advocates of the Plumb plan, and of statements, not founded on fact, made to audiences wholly unacquainted with the subject. The opinion now seems to prevail that railroad investors have not the same rights for unrestricted returns as investors in other businesses. With a reasonable degree of regulation, railroads should have the unrestricted right to make all the money they can, according to Mr. Lee. He defined the Plumb plan as not a specific proposition but rather a "play for position"---- the aim appearing to be service for the sake of service and a share in management and profits by the employees. This would not stand against the fact that the whole purpose of a final settlement should be the best service at the least cost.

Colonel Molitor opened his remarks with the statement that he considered government ownership and operation a dead issue, basing this opinion on personal experiences on a recent trip in the West on which he found a practically unanimous sentiment against government ownership and operation on the part of individuals as well as the country press. He thought the Plumb plan could be dismissed but that Colonel Wilgus' plan must be answered. Such a plan would be satisfactory in

respect to protecting securities but it would not be possible to get bidders to operate the railroads. There would be danger of more or less universal public ownership.

The Esch bill and the Cummins bill were briefly analyzed by Colonel Molitor in whose opinion the establishment of a Transportation Board, under the Cummins bill, would be a wise provision and that the valuation should be transferred to such a board. If a rate of return is to be guaranteed, it should be a variable rate according to current interest rates to be named by the Federal Reserve Board. The anti-strike provisions of the Cummins bill should be pushed to the limit. He favored Federal incorporation, provided by the Cummins bill, since it removes railroads from state control. Colonel Molitor closed his remarks with the suggestion that members of the American Society of Civil Engineers, in a personal way, should further either of these bills-- preferably the Cummins bill-- to the utmost.

B. H. Bryant spoke of his experiences in foreign countries and his observation of the results of government ownership. He pointed out the wasteful conditions in Brazil brought about by an old law, which still stands, providing a guaranteed return on a maximum expenditure per mile of line. Germany, which operated its railroads practically on a military basis, was the only foreign country which had really made a success of government ownership.

While fundamentally opposed to any form of government ownership, Charles Hansel emphasized the importance that the physical valuation bears upon the whole railroad question. It is the plan of the Interstate Commerce Commission to fix values as of June 30, 1914, deducting for depreciation, and from then on to the final date of valuation to add the cost of improvements. This Mr. Hansel considered absolutely unfair.

Mr. Besler described present tendencies toward nationalizing railroads as a form of socialism, which term he defined as the "science of envy", and which has always followed in the wake of great disasters and upheavals. He disagreed with the opinion that the proposition of government ownership is dead.

NEW INDUSTRIAL BOARD NAMED BY PRESIDENT

The personnel of the new industrial board, named by the President to work out a program for the adjustment of differences between capital and labor, after the failure of the first National Industrial Conference, was announced Nov. 20. The new board consists of:

William B. Wilson, Secretary of Labor.
Thomas W. Gregory, former United States Attorney General.
George W. Wickersham, former United States Attorney General.
Herbert Hoover, former Food Administrator.
Oscar S. Straus, former Secretary of Commerce.
Henry M. Robinson, Pasadena, Cal.
Professor Frank W. Taussig, former Chairman of Tariff Commission.
Samuel W. McCall, former Governor of Massachusetts.
Martin H. Glynn, former Governor of New York.
Henry C. Stuart, former Governor of Virginia.
Dr. W. C. Thompson, President of Ohio State University.
Richard Hooker, publisher of The Springfield Republican.
George T. Slade, formerly Vice President of Northern Pacific Railway, St. Paul, Minn.
Julius Rosenwald, President of Sears, Roebuck & Co., Chicago.
Owen D. Young, lawyer, New York City.
H. J. Waters, President of Kansas Agricultural College, Manhattan, Kan.
Stanley King, lawyer and manufacturer, Boston.

Unlike the first conference, the new body will not act as representing distinctive groups but will act in the interest of the country as a whole.

PITTSBURGH STREET-CAR LOOP SUBWAY CONDEMNED

A report rendered to the mayor and council of Pittsburgh on Nov. 22 by E. K. Morse, city transit commissioner, advocates abandoning the project of building a street-car loop subway through Grand and Liberty Streets and Second Ave. The subway would cost $6,000,000, according to estimates made last spring. A bond issue for its construction was approved by popular vote several months ago. Mr. Morse, who two years ago recommended that a rapid-transit system comprising two intersecting lines to the East End be built by the city, proposes using the bond-issue money for constructing the Grant St. and Diamond St. parts of these lines.

PROPOSED BRIDGE-INSPECTION CONTRACT IN PORTLAND

(Special Dispatch to Engineering News-Record)

Portland, Ore., Nov. 23, 1919-- Bridge-maintenance inspection under a fixed contract is under consideration by the commissioners of Multnomah County. Strong feeling has been aroused among Portland engineers by the proposed action and the matter is at present one of the main subjects of discussion in professional circles.

On account of the bad condition of the Burnside and Morrison Street bridges, which with other Willamette River bridges are maintained by Multnomah County, the commissioners asked the engineering firm of Harrington, Howard & Ash of Kansas City to submit a proposal for inspecting the old structures and designing new ones. The firm proposed a contract for semiannual inspection of all bridges at a fee of $500 per year, the service to include report on the physical condition of the structures, advice as to necessary traffic restrictions and preparation of plans for any reinforcement that might be required. When renewal of a bridge was recommended or contemplated, the engineers would make preliminary surveys, sketches and cost estimates additional charge unless the bridge was built, in which case a fee of 5% of the final construction cost was to be paid them, to cover all engineering and inspection charges. The proposed South Portland bridge was to be an exception to this arrangement; the preliminary engineering for this structure was to be compensated for at a price to be agreed on, if construction were not undertaken.

Objection was made to this proposal by the Oregon chapter of the American Association of Engineers, which claimed that competent bridge engineers could be found among the local men. In answer to the county commissioner's request for names of local bridge engineers the following were suggested: Samuel Murray, chief engineer O.W.R.R. & N.C.; C. H. Purcell, District Engineer, U.S. Bureau of Public Roads; and R. E. Kremers, chief of the city's Bureau of Construction.

No appointment has been made to date. The state highway department is inspecting the old bridges and will recommend repairs or replacement. It is thought likely that an engineer may be selected after the referendum vote on a bond issue to build the new bridges.

TRAFFIC ASSOCIATION DISCUSSES TRANSPORT PROBLEMS

Problems involving the use of highways by motor trucks; tests being made as aids to design of highways to carry heavy truck traffic; requirements of road surfaces to sustain heavy traffic; and effect of truck upon waterbound macadam and gravel roads, occupied most of the attention of the North Atlantic Division meeting of the National Highway Traffic Association, held at the Automobile Club of America, New York City, Nov. 7. Professional papers were read by A.T. Goldbeck, testing engineer, U.S. Bureau of Public Roads, on "The Present Status of Impact Tests on Roadway Surfaces;" W. G. Thompson, state highway engineer of New Jersey, on "Motor Vehicle Traffic Which Requires the Use of Cement-Concrete Foundations;" and by C. W. Reid, manager, Transportation Bureau, Federal Highway Council, on "Relation of the Motor Truck to the Railroad." In addition, information as to effects of intensive truck traffic upon gravel and waterbound macadam highways was supplied by Col. W. D. Sohier, state highway commissioner of Massachusetts.

In his discussion of the type of pavement to be used to sustain motor truck traffic, Mr. Thompson asserted that of all types yet developed, cement-concrete is the only foundation material capable of standing the strain for any appreciable length of time. Mr. Thompson declared that in view of the increasing use for freight transportation of the motor truck one could not assume that a road, once hard surfaced, was to be used solely by light motor vehicles, except in isolated rural districts. In addition, he said that design of hard-surface paving should take fully into account the traffic developments, both as to numerical, weight and dimensional increase, and that the future rather than the immediate present should be regarded in design and construction. Quoting figures from the Service Recorder Co. of Cleveland, Mr. Thompson stated that motor trucks had increased in number approximately 1,000% in the years 1912-1918; the increase being approximately 90000 per year, making the average annual investment, based on an average cost per motor truck of $3,500 of $315,000,000. In view of such an immense expenditure in trucks, Mr. Thompson is convinced that in the Middle and North Atlantic States between Norfolk, Va., and Portland, Me., no interurban highways should hereafter be built having a width of hard pavement less than 20 ft. for two lines of traffic; that graded widths for

two lines of traffic should be not less than 30 ft.; that right of way on all main highways should be 60 ft. or more; that foundations should be nothing but the best concrete obtainable, not less than 8 in. thick if other types of surfacing are to be used. Painstaking care should be exercised to provide adequate and permanent sub-foundation drainage facilities. He advocated the greatest length of visibility possible on curves to insure safety. He recommended that highway bridges be designed for not less than 20-ton loading, assuming that 75% of the load is carried on the rear axle.

The present status of impact tests, a review of which will be found in "Engineering News-Record," Sept. 18, p. 573, was explained by A. D. Goldbeck, engineer of tests, Bureau of Public Roads. His talk included an explanation of the methods used by the Bureau of Public Roads to determine motor truck wear upon different types of pavements with varying foundations. The particular feature in Mr. Goldbeck's discussion was his assertion that in the future he believed roads should be designed, not according to the gross tonnage of trucks, but according to the impact produced by unsprung weight.

It was the contention of Col. W. D. Sohier, state highway commissioner of Massachusetts, that waterbound macadam or gravel roads, if given proper surface treatment, would stand up under heavy motor-truck traffic if not more than from 100 to 150 motor vehicles a day made use of such roads. In instances where roads are constantly used by heavy traffic not even constant oiling and patching will make waterbound macadam and gravel roads, such as have been used by truck traffic emenating from army cantonments, stand up. Colonel Sohier cited the instance of one macadam road which, prior to the war, had required not more than $500 per mile per year in maintenance, but with the advent of the army trucks demanded constant attention and an average maintenance cost of $2500 per mile.

NAVAL ARCHITECTS AND ENGINEERS TELL OF PROGRESS IN SHIP BUILDING

Several new features of progress in ship construction were brought out at the annual meeting of the Society of Naval Architects and Marine Engineers in New York City, Nov. 13, 14. As at previous meetings the proceedings were about equally divided between the structural and mechanical phases of ship building.

The efficiency of a shipyard is less dependent upon plant layout than upon other factors, the principal one of which is personnel, according to the conclusion of Capt. R. E. Bakenhus, U.S.N., in a paper on the engineering features involved in efficient plant designing. From a mass of data concerning the operation and layout of the Emergency Fleet Corporation's many yards he obtained values for the several factors of hull construction and outfitting, which were shown as curves. The best producing yards, however, failed to show the most consistent layout factor curves, indicating the important part played by personnel and management.

A paper by Creighton Churchill dealt very largely with management and personnel, particularly in the phase of man-efficiency. The following deductions were made: (1) For a given man-efficiency there are a certain definite number of ways and a certain building program that will result in minimum costs; (2) As man-efficiency increases costs decrease according to a diminishing ratio; (3) The lower the man-efficiency, the greater the number of ways and the longer the building program necessary to secure most economical construction. In answer to questions Mr. Churchill asserted that the average overhead expense in a plant had been found to be about $1000 per ship per day, and that the ratio of material, labor and overhead was approximately 2:2:1 for steel ships. It has additional interest when compared with the ratio of approximately 33:44:23 as given for reinforced-concrete ship construction in a paper on that subject by R. J. Wig, former head of the Concrete Ship Division, Emergency Fleet Corporation.

Launchings in Restricted Areas

The use of wire rope cables and friction brakes to arrest a launched ship in a limited floating area and a series of subsequent experiments have demonstrated that the coefficient of friction on wire rope is 0.24, according to a paper on ship launching in restricted waters by Capt. H. M. Gleason, U.S.N., and Lt.Commander H. E. Saunders, U.S.N. The launching of three 4000-ton ships at the Mare Island Navy Yard and their stopping within 444 ft. by wire rope cables and friction brakes led to tests with a similar apparatus developed for the launching of the battleship "California". The resulting coefficient of 0.24 is 100 per cent of the 0.60 given by A. Riley in 1913.

That the slow-speed ship is the money-earning ship sums up the conclusions of a paper read by A. J. C. Robertson. His calculations demonstrated that at a speed of 10 knots, a 400-ft. ship gives practically the best earning size that can be designed, while 450 feet is the maximum economical length for a speed of 11 knots. It was also shown that the earnings of a 350-ft. ship at 13 knots will be doubled when reduced to 10 knots.

A paper favorably comparing the Isherwood (longitudinal framing) system of ship construction with the transverse system drew out a considerable amount of discussion from partisans of both. No important facts were introduced, nor were there any brought out in a somewhat acrimonious discussion concerning the relative merits of the twin beam air pump and the air ejector for turbine condensates. This discussion, characterized by the chairman as a "pump war" followed a paper on high vacuum apparatus.

A.A.E. MEETING ENDORSES GENERAL LANGFITT AND DISCUSSES FREIGHT PIER DESIGN

Resolutions advocating the appointment of Col. (lately Major General) Wm. C. Langfitt to the office of Chief of Engineers, U.S.A., in place of Major-Gen. Wm. M. Black, retired, were passed by the New York chapter of the American Association of Engineers on Nov.12. Copies of the resolution have been sent to the Secretary of War and the chairmen of the House and the Senate committees on military affairs. The meeting also endorsed the Townsend bill for establishing more efficient cooperation in highway construction on the part of the Federal government.

Zenas W. Carter, secretary of the Material Handling Machinery Manufacturers' Association, delivered an address on needed improvement in terminal planning, under the title "Design Foresight and Mechanical Handling". Showing the remarkable advantages in efficiency and economy gained at the Brooklyn army base, at the Cincinnati railroad freight terminals and at the new Pittsburgh freight station by provision for mechanical handling, he discussed the proposed plans of New York City for new piers on Staten Island in critical manner. Planned to be 125 ft. wide by 1100 ft. long, these twelve new piers, Mr. Carter stated will be too narrow to permit of efficient mechanical handling. He urged that they be made wider, built strong enough to carry cranes in future, and equipped with a double-track railway line along the sides to permit of transferring freight directly between car and ship, and he strongly opposed the attitude of the Merchants Association against planning the piers for other than present freight-handling methods.

WHIPPLE AND LONGLEY TO HEAD RED CROSS DIVISION OF SANITATION IN SWITZERLAND

American engineers will head the newly created Division of Sanitation of the Bureau of Hygiene and Public Health of the League of Red Cross Societies, the international organization which will perpetuate and expand the post-war activities of the Red Cross organizations throughout the world. Prof. George C. Whipple of Harvard University, and Col. F. F. Longley, of the firm of Hazen, Whipple & Fuller, consulting engineers of New York, have been selected respectively as director and associate director of the new sanitation division, with headquarters in Geneva, Switzerland. Col. Longley before sailing for France Nov. 29 on "La Savoie" outlined the new work:

The international Red Cross organization of which the sanitation division is a part, is provided for under paragraph 25 of the League of Nations covenant. The division will be, in effect, an international department of health. For the present, at least, its chief problems will be of an educational nature and its activities will be directed towards those countries which are now most backward in matters of sanitation. The scope of the work will be large. Its engineering features will include public water supplies and purification, sewerage and sewage treatment drainage, mosquito prevention anti-typhus campaigns-- in fact everything which is understood to be in the field of sanitary engineering. One of the division's most important duties, however, will be relief work in time of great disasters, such as floods, fires, or earthquakes.

The division's activities, of course, must be carried on with the full cooperation of the country when its work is undertaken. The first real problem will probably be a number of sanitary surveys by field parties made up for the most part of local personnel.

Prof. Whipple will join Col. Longley in Geneva early next year.

PAVEMENTS AND SANITATION MAIN TOPICS AT CONVENTION

(Concluded from page 775)

In the course of an extended review of "Roads in France and America", Major Edgar A. Kingsley, San Antonio, Tex., urged that disinterested engineers rather than promoters of the use of cement decide whether old macadam shall be used as a base for more permanent surfacing. Supplementing his paper on "Recent Developments in Concrete Highway Construction", A.N. Johnson, Chicago, called attention to threatened difficulties in connection with the immense road program for 1920. It is estimated that 125,000,000 tons of highway material will be required in open cars during the year. It is evident that plant capacities will not be enlarged to meet the demand for material unless owners can see a prospect of railway facilities to move the material. Unless more transportation facilities are provided not more than half of the needed road material can be moved. New capital for railway equipment should be provided without delay.

In a paper on "Mineral Aggregate for Bituminous Material", Wallace L. Caldwell, Birmingham, reviewed the essential qualities for sand, broken stone and gravel, in the light of studies made at the Birmingham branch of the Pittsburgh Testing Laboratory. Too many people think that the main risk in bituminous pavements lies in the binding material. Hundreds of specifications are written yearly that show a lack of knowledge of the essentials of aggregates.

Resilience was placed before strength in a paper on "Foundations for Warrenite Pavement, and Roads", by George C. Warren, Boston, particularly where the subgrade material is good. There are millions of yards of macadam that would make good bases for roadways if strengthened in places, Mr. Warren said, and yet efforts are made to waste instead of utilize this macadam. Where old macadam is used tests of its integrity should be made immediately before resurfacing, preferably by complete cross-cuts rather than test holes.

A plea for research work on soils and soil moisture in relation to pavements was a notable point in a paper on brick pavements by Will P. Blair, Cleveland, Ohio. Major E.A. Kingsley, San Antonio, commended Mr. Blair for changing from disapproval to approval of asphalt filling for joints in brick pavements and for easing up on his demands for concrete base. The methods of manufacture and the advantages of vertical fiber brick pavement were presented by C. R. Mandigo, Kansas City. This type of paving brick now makes up 99% of the output between the Mississippi River and the Rocky Mountains and has been adopted as a standard by the National Paving Brick Manufacturers' Association. No lug or joint separator is used.

A financial problem connected with worn-out pavements at Norristown, Penn., was submitted by S.C. Corson, of that city. Brick pavements paid for with 30-year bonds need renewal, all before and some long before the bonds fall due. Should the resurfacing be paid for by another bond issue or by assessment against the abutters? George H. Norton, Buffalo, N. Y., suggested, and others seemed to agree, that since the cost of the original pavements was borne by all the taxpayers it would be just to assess the cost of resurfacing on the abutters, especially as they have never paid an assessment for paving. W.W. Horner, St. Louis, said that the Association of Engineering Societies of that city recently recorded itself against a proposed $1,000,000 bond issue for renewing pavements.

City Waste Reclamation

At the conclusion of a review of city waste reclamation, S. A. Greeley, Chicago, stated that where possible garbage disposal should be considered with a view to recovering valuable constituents, but the lure of profit should not be allowed to overbalance the comfort and convenience of householders. The economic value of garbage, and of other classes of city refuse, must be weighed against cost of collection, plant cost, annual and operating charges of the utilization plant.

Sacrifice of efficiency in order to reduce operating costs is no object in the Miles-acid process of sewage treatment, said E. S. Dorr, Boston, in a paper on that process, because to cut the treatment lessens the revenue from the grease and fertilizer produced. The acid process, Mr. Dorr said, is the only method of sewage treatment that recovers grease from sewage, and the grease in sewage has double the value of the fertilizer The author believed that sludge drying alone, rather than pressing and drying, would be preferable.

After reviewing sewage utilization possibilities at some length in a paper on "Economic Values in Sewage and Sewage Sludge", Raymond Wells, of Homer, N. Y., expressed the hope that grease extraction might yield a small margin of profit. A lengthy paper reviewing five years of sewage experiments at Brooklyn was presented in abstract by George T. Hammond, New York City. If the project for a 30-ft. channel in Jamaica Bay is carried out two additional Rienseh-Wurl screens at the 26th Ward plant may be all the treatment needed, on account of the large volume of diluting water that would thus become available.

A number of lantern-slide papers on war engineering work in the United States were presented.

Morris Knowles, John M. Rice and E. O. Rose presented a paper on the housing scheme known as Loveland Farms, for the Youngstown Tube Works, Ohio.

Reports of Committees on Specifications

Most of the many standing committees on specifications reported either no recommended changes or else only minor alterations. The Committee on Cement-Concrete Pavement, Wm. A. Hansell, Jr., Atlanta, chairman, submitted a number of alterations in the old specifications. Tentative specifications for sidewalks and curbs, including both concrete and granite curbs, were submitted for the committee on that subject by Sylvenius Sammelman, chairman, St. Louis. In both these and some other cases the changes proposed were ordered printed in the 1919 "Proceedings" referred to the 1920 committee for further consideration and for submission with recommendations next year.

The Committee on Traffic and Transportation, R. Keith Compton, Baltimore, chairman, suggested that the highways of the country be divided into interstate or National, state, and local, and that uniform traffic laws be established for each class. This done, the physical requirements of construction for each class could be more readily determined. Attached to the report was a draft of a uniform traffic bill prepared by a Committee from the American Association of Highway Officials and other organizations. Closely allied to this report was a paper on "Highway Traffic", by Frederic A. Reimer, Newark, N. J. Supplementary to the paper, as printed in advance of the convention, Mr. Reimer remarked that the increased use of large pneumatic tires on heavy trucks in Essex County, N. J., promises to reduce the disintegration of pavements through vibration.

In behalf of the Committee on Street Paving, W. A. Howell, chairman, Newark, N. J., presented summaries of the work done in the last half dozen years, gathered from manufacturers of paving materials and from municipal engineers.

Good results at Buffalo, N. Y., from a fleet of 15 tractors and street flushers were reported by George H. Norton, chairman of the Committee on Street Cleaning Refuse Disposal and Snow Removal. In winter the flushers are housed and the tractors used for hauling ashes and, when needed, for snow removal.

The Committee on City Planning submitted no formal report but presented a paper on "Regional and Civic Planning as a Basis for Municipal Improvements," from Thomas Adams, lately of Ottawa. In transmitting this paper Nelson P. Lewis, chairman, New York City, commented on the work of the engineer as the basis for town planning. Mr. Lewis said that the engineer does not seem to recognize this relationship and that until he does it cannot be expected that others will do so.

For the Committee on Legislation and Finance, N.S. Sprague, Pittsburgh, summarized information gathered from a number of cities. A tendency towards greater efficiency in municipal administration and an increase in the use of adequate budgets was noted. Suggestions for budget reform made by L. L. Tribus, New York City, a member of the committee, were embodied in the report.

The new Canadian law on fire prevention, which among other things makes a penal offense of personal negligence which causes loss of life or property by fire, was outlined in the report of the Committee on Fire Prevention, sent from Montreal by Alcide Chaussé, chairman.

A considerable percentage of the American states now have engineers connected with their State Boards of Health, at salaries of $2000 to $5000 a year, stated F. A. Dallyn, chairman of the Committee on Sewers and Sanitation, Toronto, Ont.

Acting for the Committee on Water-Works, George G. Earl, New Orleans, submitted a duplicate of the report presented by him two weeks earlier at the meeting of the American Public Health Association. Mr. Earl also gave a lantern slide talk on the water, sewerage and drainage works of New Orleans, built at cost of $32,000,000, including $2,000,000 of interest charges during construction. The combined capacity of the drainage pumps is more than 7,000,000,000 gal. a day. By thorough pre-sedimentation and coagulation the mechanical filters are operated with only 0.5% of wash water.

The exhibit by associate members consisted mostly of printed matter. There were no heavy exhibits. The entertainment features included a boat ride, an automobile trip and a smoker. The attendance at the final session on Friday morning was very small.

OREGON ENGINEERS OPPOSE UNION LABEL ON PLANS

An organization of draftsmen in Portland, Ore., seeking affiliation with labor in order to force the use of a union label on engineering plans has encountered opposition from the Oregon Chapter of the American Association of Engineers. The draftsmen, having formed an organization which they designate a "draftsmen's union", sought the support of such building trades unions as were concerned in construction called for by locally-made plans and specifications. Such support was to be a refusal of members of the trade unions to work upon any projects whose plans and specifications bore no "draftsmen's union" stamp.

The Oregon Chapter of the American Association of Engineers, on Sept. 17, expressed its opposition in the following resolution:

"Whereas: One of the functions of the engineer and architect is to apply the forces and materials of nature to the use of man with the greatest economy consistent with the most satisfactory results to the contracting parties and to the public, his function is one requiring absolute independence of all influence, coercion and prejudice and the greatest freedom to exercise his judgment and skill in the design and supervision of his work.

"Therefore, be it resolved, that it is prejudicial to his interests and the interests of the public to restrict this independence and freedom by implication or otherwise, and we, the Oregon Chapter of the American Association of Engineers, resolve that to affix the stamp or label of any organization other than that of the engineer, architect or his client to plans or specifications prepared by him, is an encroachment on such independence and freedom and is economically incorrect, ill-advised and and opposed to the best interests of the community."

BIDS SOON TO BE ASKED ON WILMINGTON BRIDGE

Bids for the construction of the new memorial arch bridge at Washington St. in Wilmington, Del., will be asked some time early in December. The bridge is in charge of the Washington St. Bridge Commission, with F. W. Carpenter of Wilmington as executive officer and consulting engineer, and B.H. Davis of New York as consulting engineer. The bridge will be of concrete, with a total length of 700 ft. There are two 70-ft.spans, a central span of 250 ft., and two arches of 85-ft. span. The bridge will be 82 ft. wide, with two sidewalks 16-ft. wide and a roadway of 50 ft.

SIXTEEN MILLIONS FOR CAPE COD CANAL

As the result of the proceedings before the Federal District Court in Boston, the sum of $16,201,201 was fixed by a jury as a fair valuation of the Cape Cod canal. Last session Congress authorized the purchase of this canal from the Boston, New York & Cape Cod Canal Co., builders of the waterway. The sum noted is far in excess of what the government has offered the canal for the property, and no statement has yet been given out as to what the next step in the acquisition of the canal will be.

COLORADO SLOW IN PUTTING LICENSE LAW INTO ACTION

Although a license law was enacted by the Colorado legislature last spring, no licenses have yet been issued and V. A. Kauffman, in a recent issue of the Official Bulletin of the Colorado Society of Engineers, declares that the obstruction toward putting it into effect comes from the Colorado Section of the American Institute of Mining and Metallurgical Engineers. This society at a meeting in September resolved to ask for a repeal of the law and subsequently sent out literature explaining its action on the ground that the law excluded aliens from obtaining a license. Mr. Kauffman concludes that the alien members are not only honored but sufficiently powerful in their organization to direct its activities against the best interests of this state as well as of the profession. Mr. Kauffman was at the miners' meeting and states that 75% of those present, including the aliens, admitted not having read the law, and furthermore, the aliens led the assault on the law. The miners later called on the Colorado Section of the American Society of Civil Engineers to endorse their stand but the latter went on record as being against the repeal.

On the matter of aliens Mr. Kauffman comments as follows: "Most of us agree that a country which supports us is good enough to tie to. Some alien engineers of the miners' organization have been in this country as long as 20 years, yet have not seen fit to become naturalized. It occurs to me that we have had enough of alien dictation in our political affairs, and from the foregoing two things are obvious: First, aliens not entitled to a vote must not be allowed to evade this restriction. Second, our societies must not allow themselves to be used by the alien as a channel through which he may accomplish the same result as if he were allowed to vote. Therefore, alien members of societies should be denied any voice in those affairs of their societies which are of a political nature, or aliens must be excluded from the societies. We cannot afford to have the recommendations of the societies on political affairs questionable. Their recommendations must express the views of citizen members only, else the rights of citizenship are of no value."

The model law which Engineering Council's Committee has just drafted calls for citizenship in the United States or Canada or declaration of intention to become citizens. The new model law of the American Institute of Architects makes no provision for other than citizens or those who have declared their intention of becoming citizens.

The miners were apathetic during the campaign which the Colorado Society of Engineers waged almost single handed to make the bill a law, although earnest appeals for assistance and guidance were made to every engineering society and individual in the state that could be reached.

In Denver there is an Engineering Council with representatives of the various technical societies. This body considered the law this summer and concluded that while it was not ideal there was nothing vicious in it and decided not to oppose it or ask for its repeal.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

NATIONAL RIVERS AND HARBORS CONGRESS 824 Colorado Building, Washington, D. C.; Dec. 9-11, Washington, D. C.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.; Dec. 8-11, Louisville, Ky.

BRIDGE BUILDERS' & STRUCTURAL SOCIETY 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

The Detroit Engineering Society will discuss the Jones-Reavis Bill, proposing the establishment of a National Department of Public Works, at its meeting Friday, Nov. 28. Charles Whiting Baker, chairman of the Public Affairs Committee of Engineering Council and consulting editor of "Engineering News-Record", will open the discussion, in which David A. Molitor will be the other principal speaker.

The Cleveland Engineering Society will have as its principal speaker, at the Dec. 2d meeting, Gardner S. Williams, consulting engineer of Ann Arbor, Mich. Mr. Williams will speak upon the work of the aims and organization committees of the national engineering societies.

The Rochester Engineering Society held a joint meeting on Nov. 21 with the local chapter of the American Society of Mechanical Engineers. The use and application of belt and other conveyors to manufacturing was discussed by several representatives of manufacturing firms.

The Montreal Branch of the Engineering Institute of Canada, at its meeting on Nov. 17, discussed the relationship that architects should hold with respect to the construction of big bridges. The discussion was preceded by a paper on "Automatic Fire Sprinkler Systems for Low Temperature Buildings," by Maj. Percy Sims.

The Albany Society of Civil Engineers listened to a discussion of the activities of Engineering Council

regarding national engineering matters by M.O.Leighton, chairman of the National Service Committee of Engineering Council, at the meeting on Tuesday, Nov. 25.

The New York Chapter of the American Association of Engineers begins its membership drive Dec. 1. During the drive, which is to last thirteen days, the New York Chapter hopes to add 300 to its embership.

The Cleveland Chapter of the American Association of Engineers has issued a call for a mass meeting of professional engineers, architects, chemists, surveyors, and draftsmen, of greater Cleveland, to be held Dec.4. Speakers at the mass meeting will acquaint those present with the past and future wage activities in the railroad, industrial, and public engineering fields carried on and to be prosecuted by the American Association of Engineers.

PERSONAL NOTES

JAMES F. SANBORN has opened an office in New York City as consulting engineer. Preceded by a period in which he was engaged on mining and geological investigations, his professional experience has been gained principally on the New York subway construction and the Catskill aqueduct. Mr. Sanborn is widely known as an expert in subsurface work of all types and particularly those features which relate to preliminary investigation of geological conditions by means of deep borings. In tunneling both in compressed air and open air, and in shaft sinking Mr. Sanborn has had a long and varied experience. One of the subjects to which he has devoted a great deal of effort, and on which his opinion has frequently been sought, is the grouting of shafts or tunnels in order that excavation may proceed through "bad" ground, especially where subsurface water is encountered.

FRANCIS DONALDSON announces that he and Paul M. Kuder have organized the American Contracting Co., with offices in New York City. Marcus M. Farley will have charge of the engineering work in the New York district. The company will serve as consulting civil engineers, mechanical engineers and auditors and is also prepared to reorganize, refinance and manage industrial properties. Mr. Donaldson brings to the new organization a long experience in the general contracting business. As chief engineer of the Dravo Contracting Co., of Pittsburgh, and later of the T. A. Gilleppie Co., of New York, he has been engaged on a wide variety of large-scale construction, particularly tunneling and shaft-sinking in connection with the Catskill aqueduct and the New York subways.

MAJ. CLINTON H. FISK, U. S. A., previously chief engineer of construction, city of St. Louis, has become vice-president of the United States Bank, St. Louis.

L. A. CANFIELD, A. W. LEE and ALVIN LE VAN have opened a consulting office in the Flynn Building, Des Moines, Ia., under the firm name of the Canfield Engineering Co.

R. V. GLENN, has resigned as senior highway engineer on Federal Aid projects at Forth Worth, Tex., to become consulting highway engineer of Tarrant County. He will remain at Fort Worth.

HALE SUTHERLAND, instructor, department of civil engineering, Massachusetts Institute of Technology, has been appointed assistant professor of structural engineering.

T. KEITH LEGARE, city engineer, Columbia, S.C., has resigned to enter private practice, specializing in highway and municipal engineering, with headquarters at Columbia.

G. S. HEWINS, former manager for L.H.Shattuck, Inc., Newington Shipyards at Portsmouth, N.H., has taken charge of construction work for the New England Power Co., with headquarters at Vernon, Vt.

CAPT. ANDREW H. HOLT, Engineers, U.S.A., discharged from the service, has returned to his former position as assistant profresor of civil engineering, College of Applied Science, University of Iowa.

H. V. LATHAM, formerly chief engineer, Porto Rico Irrigation Service, has been appointed chief engineer, Isabela Irrigation Project, for which the legislature of Porto Rico recently authorized a $3,000,000 bond issue. Mr. Latham has been in the service of the Government of Porto Rico for the past seven years, engaged in irrigation and public utility work. For many years he was resident engineer and assistant chief engineer, Mexican Light & Power Co., Necaxa, Mexico.

H. B. LIVINGSTON has resigned his position as chief engineer of the Cameron County Water Improvement District No. 2, at San Benito, Tex., and is now president and chief engineer of the Rio Grande Engineering Co., at the same city.

A. LINCOLN FELLOWS, formerly of the firm of Field, Fellows and Hinderlider, has opened a consulting office in Berkeley, Cal.

MAJ. L. D. BLAUVELT and CAPT. H. G. BURROWS have opened a consulting office in Denver, Col., under the firm name of Burrows & Blauvelt.

M. A.MILLER, formerly with the U. S. Department of Roads, has been made chief draftsman for the Montana Highway Commission at Helena.

THOMAS W. MACARTNEY, Yakima, Wash., has been promoted from assistant drainage engineer to chief drainage engineer for Yakima County, succeeding J. O. Greenway who has resigned.

EARL CHURCH, who during the war was engaged in France in geodetic operations and artillery fire control, has been appointed professor of civil engineering, Pennsylvania Military College, Chester, Penn.

CAPT. CHARLES H. LEE, 26th Engineers (Water Supply), U.S.A., recently discharged from the service, has been appointed executive member, California State Water Commission.

ROBERT A. CAUGHEY, formerly associate professor of civil engineering, Pennsylvania State College, has been appointed associate professor of structural engineering, Civil Engineering Department, Iowa State College.

MAJ. J. F. CARROLL, Engineers, U. S. A., recently discharged from the service, has returned to his former work as superintendent of construction, Department of Public Works, St. Paul.

WALTER E. ROSENGARTEN has resigned as highway engineer, United States Bureau of Public Roads, to become traffic engineer, Asphalt Association, New York City.

WILLIAM EASBY, JR., has resigned as professor of municipal engineering, University of Pennsylvania, to engage in private practice with offices in the Commonwealth Building, Philadelphia.

CAPT. ROBERT B. MURDOCK, U. S. A., recently discharged from the service, has been appointed executive engineer, Asphalt Association, New York.

J. E. KIRKHAM, formerly professor of structural engineering and chairman of the civil engineering faculty, Iowa State College, has resigned to become bridge engineer, State Highway Commission, South Dakota.

OBITUARY

W. DALE HARRIS, former president, Montreal Terminal Ry., died recently at Ottawa, Ont. He was a graduate of the Massachusetts Institute of Technology and had been connected with the Brookline & Boston Water-Works and the construction of the Intercolonial Ry. and the Nova Scotia Ry.

PROF. JOHN VOSE HAZEN, for the past 21 years connected with the civil engineering department, Dartmouth College, died recently at Hanover, at the age of 69.

ALBERT J. HIMES, valuation engineer, New York, Chicago & St. Louis R. R., died in Cleveland Nov. 5 at the age of 55. He graduated from Cornell in 1887 and except for a period of about three years he had engaged in railroad engineering. He entered the employ of the New York, Chicago & St. Louis R. R. as bridge engineer in 1901 and was appointed assistant chief engineer in 1907, and afterwards engineer of grade crossing elimination.

NATHAN F. BARRETT, landscape architect, New York City, past president of the American Society of Landscape Architects, died recently in Mt. Vernon, N. Y.